

**RESTORATION ADVISORY BOARD MEETING
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT (NWIRP), BETHPAGE
TOWN OF OYSTER BAY, BETHPAGE COMMUNITY CENTER
103 GRUMMAN ROAD WEST, BETHPAGE, NEW YORK
WEDNESDAY, NOVEMBER 16, 2016**

The thirty-ninth (39th) meeting of the Restoration Advisory Board (RAB) was held at the Bethpage Community Center in Bethpage, New York. Meeting attendees included representatives from the Navy (Lora Fly), The Management Edge (Gayle Waldron), New York State Department of Environmental Conservation (NYSDEC) (Henry Wilkie), New York State Department of Health (NYSDOH) (Steve Karpinski), Nassau County Department of Health (NCDOH) (Joseph DeFranco), United States Environmental Protection Agency (USEPA) (Peter Mannino), Town of Oyster Bay (John Ellsworth), Town of Hempstead (John Reinhardt), KOMAN Government Solutions, LLC (Greg Pearman and Jennifer Good), Bethpage Water District (BWD) (Michael Boufis, Michael Ingham and John Sullivan), Massapequa Water District (MWD) (Stan Carey, Thomas Hand and Joseph Tricarico), South Farmingdale Water District (SFWD) (Len Constantinopoli, Frank Koch), Tetra Tech (David Brayack), Nassau County Legislature (Laura Schaefer, and Rose Walker) and Resolution Consultants (Farrell Bell, Brian Caldwell, Gordon Hicks, Valerie Thayer, Vincent Varricchio, Eleanor Vivaudou, and Michael Zobel). RAB members in attendance were Robert Horan, Sandra D'Arcangelo, Edward Olmstead, and David Sobolow. There were 33 residents from Bethpage and neighboring towns in attendance. There were 9 individuals from the newspapers. The meeting sign-in sheet is provided as Appendix A.

OPEN HOUSE SESSION

Prior to the start of presentations, an open house session was held. There were two groups of informational poster displays and an area for residents to speak with regulators. The public was invited to peruse the information provided and ask questions to the Navy representatives, contractors, and regulators.

WELCOME AND AGENDA REVIEW

The Navy representative, Ms. Lora Fly, welcomed everyone to the RAB meeting and presented the meeting agenda. Ms. Fly also introduced Gayle Waldron (The Management Edge, serving the role of facilitator in support of the RAB) who then went over the Rules of Conduct to ensure that everyone is allowed the opportunity to comment. The Rules of Conduct are provided in Appendix C. Ms. Fly informed the attendees about navigation of the public website for NWIRP Bethpage (<http://go.usa.gov/DyXF>). Ms. Waldron introduced David Sobolow, the RAB co-chair. Mr. Sobolow introduced the three RAB members present and explained that they are to be the interface between the community, the Navy and the regulators. Ms. Waldron then invited the water districts and the

regulators who were present to introduce themselves. A quorum of RAB members was not present; and the April 2016 meeting minutes were put on hold.

OU2 OFFSITE GROUNDWATER INVESTIGATION, AND CAPTURE ZONE UPDATE

OU2 Offsite Groundwater Investigation:

Mr. Brian Caldwell, Resolution Consultants, presented the offsite groundwater program objectives. Mr. Caldwell reviewed the local groundwater geology and its applicability to the plume and presented the vertical profile borings (VPBs) and wells that have been installed and sampled since 2009. He described work performed since the last RAB meeting, future work to be implemented and recent reports with their respective results. Mr. Caldwell also provided an update for the Bethpage Water District Plant 6 Capture Zone Pilot Study. The presentation is included in Appendix C.

As described in the presentation, the objectives of the offsite groundwater investigation are as follows: to protect the public water supply wells, to delineate the RE108 hotspot, and to evaluate the capture zone of BWD well 6-2 to ascertain its influence on the hotspot while identifying alternate locations in the event a separate treatment system is needed. Protection of the public water supply wells is fulfilled by installation of outpost monitoring wells coupled with groundwater testing. In addition, the water level data was collected to ensure successful monitoring of outpost wells, and supports the Navy and United States Geological Survey (USGS) groundwater modeling efforts which are designed to determine capture zone analysis for wells as needed for groundwater cleanup.

The process of determining VPB and well locations was then described. Locations are determined based on three criteria: areas designated as critical for tracking the plume, minimization of inconvenience to nearby residents, and space requirements for drilling rig operations.

For discussion purposes, the areas of investigation have been divided into three geographic zones and are referred to as areas north of Hempstead Turnpike, north of Southern State Parkway, and south of Southern State Parkway. Work performed since April 2016 includes: mobilization of three drilling rigs, installation of four monitoring wells (located north of Hempstead Turnpike), installation of two monitoring wells and commence installation of three VPB and their six associated monitoring wells (north of Southern State Parkway), and one VPB and two associated monitoring wells (south of Southern State Parkway). Work also included two rounds of quarterly groundwater sampling. The results of the recently installed VPBs and the quarterly groundwater sampling results were also presented. Future work through November 2017 includes: continued mobilization of two drilling rigs; installation of four additional VPBs and 14 monitoring wells north of Hempstead Turnpike and one

VPB and seven monitoring wells north of the Southern State Parkway; installation of VPB171 and the associated Test Recovery Well RE137 to address the RE108 hotspot and continued quarterly groundwater sampling.

BWD Plant 6:

An update on the BWD Plant 6 Capture Zone Pilot Study was presented. The purpose of the capture zone analysis test was to identify the effect of BWD Plant 6 wells in relation to the RE108 hotspot. The test began on March 21, 2016 and was completed on April 29, 2016. Data from observation wells was collected and analyzed weekly to determine the effects of pumping. The data indicated that at a pumping rate of 1,153 GPM the BWD well 6-2 would capture a maximum of 100% of the deep RE108 hotspot (greater than 700 feet) and 14% of the intermediate (600-700 feet) and shallow (500-600 feet) RE108 hotspot.

RE108 HOTSPOT UPDATE

Mr. David Brayack of Tetra Tech provided a presentation outlining the RE108 hotspot area investigation/remediation and the feasibility study addendum for Site 1, Former Drum Marshalling area. The presentations are included in Appendix C.

RE108 Hotspot Update:

The RE108 hotspot was confirmed in 2011 by the presence of trichloroethene (TCE) in groundwater at concentrations greater than 1,000 parts per billion (ppb). Mr. Brayack went over the conceptual site model for the hotspot area, plume delineation, elements of the remedial design and presented the area needed to house the extraction wells and pumping/air stripping equipment. He then discussed water disposal options that are currently under evaluation. Mr. Brayack also provided a preliminary time line for system design and startup.

Site 1 Feasibility Study Addendum (Former Drum Marshalling Area):

An update on NWIRP Bethpage Site 1 (Former Drum Marshalling Area NWIRP Bethpage) Feasibility Study was presented, which included a summary of the site history, remedial investigation and a path forward.

Ms. Fly provided an update on site 4. The Navy has a contractor slated to install a steam injection system in spring 2017. The Navy is currently working on a workplan to send to the DEC for review. Discussion questions and answers were as follows:

- 1. There has been an extended drought. Can you correlate rainfall concentration?**
– Mr. Caldwell answered that there is an ongoing effort to evaluate trends in groundwater over time, which can then be used to determine if there is a correlation.
- 2. Can you determine if the contamination is coming from the surface?** – The offsite groundwater contamination is deep; it entered the groundwater years ago from surface locations onsite, and it has migrated deeper as it has moved offsite and downgradient.
- 3. Is there more contamination migrating down due to the rainfall?** – We believe that all the source areas on NWIRP have been cleaned up.
- 4. Is the RE108 Hotspot the same as what is on site?** – Onsite contaminated groundwater is being addressed by Northrop Grumman (NG) using an onsite containment (ONCT) system which operates at 5-7 million gallons per day. The RE108 hotspot is off site and is being addressed by the Navy.
- 5. Does NG report the amount of contamination that is collected by their system?**
– Mr. Wilkie stated that the DEC receives an annual report detailing how much water is treated and how much water is discharged into the ONCT recharge basin. NG also collects samples quarterly.
- 6. Is there coordination between NG and the Navy?** – NG is drilling wells on Broadway under the OU3 ROD and is dealing with the separate plume coming from Bethpage Community Park (BCP). There are two hotspots currently being investigated: one by NG and one by the Navy. There is also the GM38 hotspot which is currently being remediated by the Navy.
- 7. Have you determined the size of the recharge basin that will be needed for the RE108 Hotspot remediation?** – Mr. Brayack stated that the Navy has looked at the recharge basins in the area. The Navy is still evaluating remedial alternatives for the disposition of treated water. The Navy anticipates if basin discharge of treated water is the eventual remediation plan, it will require 1.5-3 acres in size to address the water.
- 8. Has the Navy looked at land near Hicksville Road? What is the status?** – Ms. Fly stated that the Navy has a moratorium on buying property. The Navy is currently putting together a package that has to go to Congress and then the Navy can proceed. The Navy is aware that the land for extending Bethpage Parkway Right of Way may be available. The Navy will have to talk to the state. As stated before, the Navy is still evaluating the ideal location for a treatment system and disposition of the treated water.
- 9. Does NG hold meetings to explain the plume to the public?** – Ms. Fly stated that she is not aware of public meetings held by NG. The Navy, NG, and the water districts do have quarterly meetings with the EPA. Any questions regarding the OU3 plume should be directed to the DEC or NG.

- 10.The BWD asked if NG is obligated to hold meetings? (question directed to Mr. Wilkie)** – Mr. Wilkie of the NYSDEC answered that he did not believe that there is a requirement for NG to hold meetings.
- 11.Why is the plume called the Bethpage Plume and not the NG/Navy Plume?** – Mr. Sobolow stated that it is part of public record.
- 12.Are upgradient recharge basins being considered too?** – Mr. Brayack stated that on-site property basins have been evaluated and they were found to be fully utilized. Downstream recharge basins are preferred in order to prevent treating water multiple times.
- 13.What happens if the property needed is not acquired?** – Ms. Fly stated that in order to construct plans the Navy will have to acquire property. The Navy will look at available property and will negotiate with the owner.
- 14.Is BWD testing water in people’s homes?** – Mr. Boufis replied that the drinking water is not being tested in people’s homes. BWD tests the water at their plants and at various locations throughout the system prior to distribution. The Department of Health does additional water testing.
- 15.Has the Navy looked into the vacant property south of the middle school just north of Hempstead Turnpike between Steward Avenue and the Hospital?** – Mr. Brayack stated that Nassau County has many basins throughout the area. If the treatment system is on one side of Hempstead turnpike and the basin is on the other, then Hempstead Turnpike will have to be closed for short periods of time. It is preferable to keep the system and the basin close because the area of concern is south of Hempstead Turnpike.
- 16.Will the proposed recovery well capture the 422 parts per billion concentrations at RE121 south of Hempstead Turnpike?** – Mr. Caldwell stated that the extent of the capture zone is unknown, but the Navy will perform an aquifer test in January to ascertain the extent of the capture zone.
- 17.Is the schedule for the 2022 startup of the RE108 hotspot acceptable to the NYSDEC?** – Mr. Wilkie stated that it all depends on how fast the design is completed. The 2022 date may seem to be a long way off, but it is a reasonable time.
- 18.Why can’t the startup be completed sooner than 2022?** – Ms. Fly stated that the Navy needs to acquire the property. The Navy has to send the request up the command chain and then to Congress. 2022 is a realistic timeframe. If possible it will get done quicker. Funding is not the issue; it is getting the approvals.
- 19.Is it safe to drink the water?** – Yes.
- 20.Has the Navy looked to DOH to correlate the disease rate/cancer rate to contamination levels?** – Mr. Karpinski (NYSDOH) stated that the DOH looked at the data and currently there is no exposure pathway for people.

- 21.The Massapequa Water District asked how does the DOH account for the risk associated with unregulated contaminants?** – Mr. Karpinski stated that while people could theoretically be exposed to unregulated contaminants, there is no regulatory mechanism in place to manage that exposure. If the chemicals are regulated by the state, however, then exposure risk is managed by the treatment required to be done by the water districts.
- 22.Does the SFWD remediate the plume at their site?** – A representative from the SFWD answered that there is treatment on two wells. The plume has not impacted SFWD as of today but there is proactive treatment on Plant 1 and 3 which are tested monthly and are running.
- 23.Have you looked into the use of radium on site for the Navy and NG?** – Ms. Fly stated that the Navy has done extensive research at NWIRP and NG was tasked to do the same. Currently the NYSDEC has the Navy's information.
- 24.What about the nuclear fuel rods that were made to the north of the site at the Sylvania facility in Hicksville?** – The GI Sylvania within the New Cassel Superfund site is three miles to the west of NWIRP, and with flow from north to south it is highly unlikely that site would impact OU2. Relative to radium, Mr. Willkie stated that there are 70 wells around the property that have been sampled and there was a more focused study in April 2016 based on the relation of the BCP to BWD Plant 4. NYSDEC has the data and it is being validated. The NYSDEC has asked NG and the Navy to look into their archives to make sure there was no radiological activity on their property. The DEC is waiting for the in-house data and any historical activity information from NG and the Navy and will incorporate it into the report.
- 25.How would residences know the levels of VOC and TCE in the water districts south of the Southern State parkway?** – The water districts supply an annual water quality report to the residents every year in May. The water districts would have to report to the DOH if there are any exceedances.
- 26.Why not purchase land further to the south?** – Ms. Fly stated that there is not a lot of free space available. The Navy has to identify an area and go through the approval process.
- 27.Why did the Navy choose the cheaper alternative on page 10 and 11 under Site 1?** – Ms. Fly answered that the Navy tries to weigh all the options before making a final decision and come up with a proposed plan that is sent to the DEC for comment. All options are evaluated according to NYSDEC Superfund requirements.
- 28.What is being done about the people that were at Bethpage High School in 1979?** – Mr. Karpinski stated the DOH is not looking at specific cases. It looks at potential exposure levels, projects backwards in time and uses that information to evaluate the potential for people to get sick at those exposures.

29. Has a study been completed on the feasibility of a hydraulic curtain at Southern State Parkway? If so what was the outcome? –There was a study done on the feasibility of a hydraulic curtain, funded by NYSDEC. The study was submitted for public comment. Those comments are currently being evaluated by NYSDEC.

CLOSING REMARKS

Mr. Sobolow thanked everybody for coming to the meeting, stated that the next meeting would be in April and that the meeting was adjourned.

APPENDICES

APPENDIX A
16 NOVEMBER 2016 RAB MEETING SIGN-IN SHEET

39th RAB Meeting for NWIRP Bethpage
November 16, 2016
Sign-in List

Name (Print)	Address and/or email if interested in being on mailing list	Affiliation	How did you hear about the meeting?
Frank Rizzo			
Noreen Gonzalez			
Valerie Thayer			
M. Bohms			
ROBERT HORAN			
MATTHEW KERM			
Darlene Cannata			
FRANK KICH			
Lew Puopolo			
Gerald Surface			
SANDRA DARCANGELO			
Louis Knowles			
John Sommerville			
JOSEPH TRICARICO			
HENRY WILKIE			
MIKE HAUPTMANN			

39th RAB Meeting for NWIRP Bethpage
November 16, 2016
Sign-in List

Name (Print)	Address and/or email if interested in being on mailing list	Affiliation	How did you hear about the meeting?
Gordon Hicles			
Mike Zobel			
Farrell Bell			
Dave Brogock			
Soma Das			
Lara Danna			
Elizabeth Danna			
Jeff Stroud			
Joe DeFranco			
Scott Wolff			
Michael Morris			
ED OLMSTEAD			
Vivian Smith			
Patrick Smith			
Frank Mekeiney			
Glen Harman			

39th RAB Meeting for NWIRP Bethpage
November 16, 2016
Sign-in List

Name (Print)	Address and/or email if interested in being on mailing list	Affiliation	How did you hear about the meeting?
PATRICIA KNECHTEL			
Otto Knechtel			
SAUL ASH			
Teri Black			
Todd Cozart			
JOHN SULLIVAN			
Steve Karginiski			
DEL PRETE			
Ro Pitman			
Jack Furman			
Joanne Perino			
Rose Walker			
Laura Schoeffe			
Jen Good			

39th RAB Meeting for NWIRP Bethpage
November 16, 2016
Sign-in List

Name (Print)	Address and/or email if interested in being on mailing list	Affiliation	How did you hear about the meeting?
Seán Crowley			
GARY McADAM			
Eleanor Vivandav			
Stan Carey			
Stephen Foley			
M. Mulka			
LEN CONSTANTINOPOLO			
DAVID SOBOLOW			
SHAWN COLLINANE			
Linda Cestra			
Anne Hartmann			
R.J. Vernioia			
MARTIN HACKER			
John Reinhardt			
Rita Frank			

39th RAB Meeting for NWIRP Bethpage
November 16, 2016
Sign-in List

Name (Print)	Address and/or email if interested in being on mailing list	Affiliation	How did you hear about the meeting?
Bill Pavone			
Tom Hand			
LINA MCGOVERN			
JAMES DONNELLY			
Peter Mannino			

39th RAB Meeting for NWIRP Bethpage
November 16, 2016
Sign-in List

Name (Print)	Address and/or email if interested in being on mailing list	Affiliation	How did you hear about the meeting?
Mike Boufis			
Michael Ingham			
John Ellsworth			
Emily Dooley			
JoAnne DelPete			
Alyse Delle Fave			

APPENDIX B
RAB MEETING AGENDA AND DEFINITIONS

Agenda for Restoration Advisory Board

Naval Weapons Industrial Reserve Plant Bethpage

Date: November 16, 2016

Time: 6:30 PM

Location: Bethpage Community Center-103 Grumman Road West, Bethpage NY

Time: 6:30 PM to 7:00 PM

- Open house - general questions from the public

Time 7:00 PM to 8:00 PM

- Ground Rules – *The Management Edge*
- Introduction of RAB members and Regulators - *Navy Co-Chair/Community Co-Chair*
- Distribution of minutes – *Navy*
- OU-2 Offsite Groundwater Investigation– *Resolution*
- RE108 Hot Spot update/ Site I former Drum Marshalling Area Status Update – *Tetra Tech*

Time 8:00 PM to 8:30 PM

- Questions – *Community Co-Chair*
- Closing remarks – *Navy*

Copies of information can be found at the document repository located at the Bethpage Public Library, 47 Powell Avenue, Bethpage NY 11714 (516 931 9307) or online at <http://go.usa.gov/DyXF>.



RAB Members

David Sobolov – Community Co-Chair
Tim Cook
Sandra D'Arcangelo
Robert Horan
Ethan Irwin
Jeanne O'Conner
Ed Olmsted
Eugenia Mazzara
Irene Shapiro
Rosemary Styne
Roy Tringali
Rose Walker

NYSDEC

Jim Harrington
Steve Scharf
Henry Wilkie

NYSDOH

Steve Karpinski

NCDOH

Joe DeFranco

Definitions and Clarification of Terms, Acronyms and Abbreviations

For the Bethpage Restoration Advisory Board (RAB)

- **Basic:**
 - VOC--Volatile Organic Compounds:
 - Chlorinated solvents (typically used as degreasers in manufacturing)
 - Effluent
 - Is an outflow of water from a treatment source
 - Free Product
 - Substance (usually oil or gasoline) that exists in its own state-it is not dissolved in water.
 - Soil Vapors
 - Gases contained in the pore spaces of soil
 - Capture Zone
 - Area of water whose flow direction is influenced by pumping
 - Ground Water
 - Water flows through open pore spaces of soil
 - Down gradient
 - The direction of groundwater flow
 - Plume
 - An area that impacts from chemicals are detected in
 - Raritan Clay Layer
 - A geologic horizon - Clay that is approximately 800-100 feet below ground surface – accepted to be the bottom of the Magothy aquifer
 - Aquifer
 - an underground layer of water-bearing permeable rock or unconsolidated materials
 - Trichloroethylene-
 - Volatile organic compound of concern (used as a degreaser in manufacturing)
 - OU- Operable Unit
 - BGS - Below Ground Surface
 - PCB- Polychlorinated Biphenols (used as transformer cooling fluid)
 - NG- Northrop Grumman
 - NWIRP-Naval Weapons Industrial Reserve Plant
 - No. 6 Fuel Oil- tar
 - Hot spot
 - Area where trichloroethylene is at a concentration greater than 1000 parts per billion
 - BWD Plants- Bethpage Water District Plants

- **Data Gathering:**

- Gauging- measurement of ground water levels from top of ground surface
- In-situ – in place
- Delineate- define boundaries
- VPB- Vertical Profile Boring
- Monitoring Well- (typically 2-6 inches in diameter) a well used to provide a “snapshot” of water quality when sampled

- **Treatment Technologies:**

- Biosparging
 - Removal of chemicals by breaking them down with bacteria
- Steam Injection/Free Product Recovery
 - Heating of oil that has a tar like consistency with steam to make it flowable (syrup like consistency) so that it may be removed
- Air Stripping
 - Removal of dissolved volatile organic compounds from water by transferring it into air
- Land Use Controls
 - Action that restricts what land can be used for
- Vapor Phase treatment-
 - Removal of a chemical from gas; used to remove trichloroethylene from air vapor
- Biodegradation
 - Reduce a chemical by changing conditions so that bacteria can break down the chemical
- On-site Containment Treatment System (ONCT)
 - Series of wells that remove and treat groundwater at the southern edge of the former Northrop Grumman property
- SVECS—Soil Vapor Extraction Containment System
 - Vacuum for volatile chemicals trapped in the air between soil particles; used to remove trichloroethylene
- Equalization Tank
 - Tank for mixing
- Liquid Phase Granular Activated Carbon Polishing
 - Removal of remnants of a volatile chemical by passing liquid through carbon; used to remove trichloroethylene

- Recharge basin
 - Sandy basin that receives storm water and allows water to filter down into the ground
- Recovery Well
 - (Typically larger diameter 12 to 36 inches) a well used to recover oil or water containing chemicals
- **Regulatory:**
 - Proposed Plan- Plan of action that is sent to the state for approval prior to the Final Record of Decision
 - Feasibility Study- collection of data used to determine if a remedy will work
 - ROD –Record of Decision
 - Compliance sampling- collection of samples to demonstrate that chemicals are below regulatory levels
 - CERCLA- **Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)** – the legal mechanism for cleaning up inactive hazardous waste sites at DOD (Depart of Defense) facilities, this is the defining regulation for the Navy’s Environmental Restoration (ER) Program at NWIRP Bethpage under NYSDEC authority.
 - RCRA- **Resource Conservation and Recovery Act (RCRA) Corrective Action** – a statutorily required cleanup program, similar to CERCLA, that addresses active solid waste management units and contaminated media as a condition of RCRA permits - NWIRP Bethpage has a RCRA Permit with NYSDEC
 - NYSDEC- **New York State Department of Environmental Conservation (NYSDEC)** provides regulatory review and approval of Navy actions at NWIRP Bethpage
 - NYSDOH- **New York State Department of Health (NYSDOH)** assists NYSDEC.
 - USEPA- **United States Environmental Protection Agency (USEPA)** Provides federal review of the Navy actions.

APPENDIX C
PRESENTATIONS



GROUND RULES

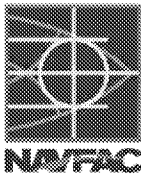
NOVEMBER 2016 RESTORATION ADVISORY BOARD (RAB)

NAVAL WEAPONS INDUSTRIAL
RESERVE PLANT BETHPAGE
LONG ISLAND, NEW YORK

11/16/2016

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT

BETHPAGE RAB GROUND RULES



- **Respect others:**
 - One Speaker at a time
 - No interruptions
 - No side conversations
 - Listen and stay open to all points of view
- **Ask questions or make statements after all the presentations are given: (approximately 8:00)**
 - During the presentations, write any questions on the cards on your table and pass them forward, or raise them and they will be picked up and taken to the RAB Community Co-Chair.
 - They will be answered after presentations are completed.
- **Stay focused on the topics; avoid digressions.**
- **Turn cell phones and /or pagers off, or on vibrate, and respond outside or during breaks, except for emergencies.**



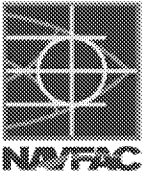
OPERABLE UNIT 2 - OFFSITE GROUNDWATER INVESTIGATION AND CAPTURE ZONE UPDATE

NOVEMBER 2016 RESTORATION ADVISORY BOARD

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE
LONG ISLAND, NEW YORK

11/16/2016

PRESENTATION LAYOUT



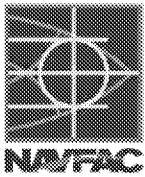
Operable Unit 2

1. Program Objectives
2. Local Groundwater Geology and Applicability to Bethpage Plume
3. 2009 – 2016 Vertical Profile Borings and Wells
4. Recent Work (Performed since last Restoration Advisory Board)
5. Future Work
6. Assessing Results and Recent Reports and Findings

Capture Zone Analysis Testing

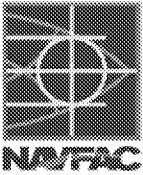
1. Update

OBJECTIVES OF OFFSITE GROUNDWATER INVESTIGATION



1. **Protection of public water supply wells –**
 - All currently planned outpost wells are in place and being monitored quarterly
2. **Characterization of the OU2 Plume (RE108 Hotspot) –**
 - Installation of Monitoring Wells and Vertical Profile Borings to Delineate the Hotspot
3. **Capture Zone Analysis Test –**
 - Pilot Study in cooperation with Bethpage Water District (BWD) to evaluate the capture zone of one of their wells
 - Installation of a test recovery well and aquifer testing in the area southwest of BWD Plant 6

OFFSITE GROUNDWATER INVESTIGATION

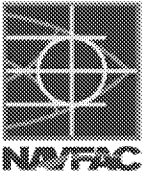


Purpose: Delineate groundwater contamination in areas south of Naval Weapons Industrial Reserve Plant Bethpage

Program Components:

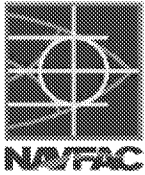
- **Vertical Profile Borings (VPB)** - quickly screen areas for the presence, depth, and concentration of contamination; drilling can take 4-8 weeks to complete
- **Permanent Monitoring Wells** - confirm presence/absence of contamination and develop trends; drilling can take 2-6 weeks to complete
- **Data logging of water levels** - support modeling and capture zone analysis for wells

VERTICAL PROFILE BORINGS (VPB)



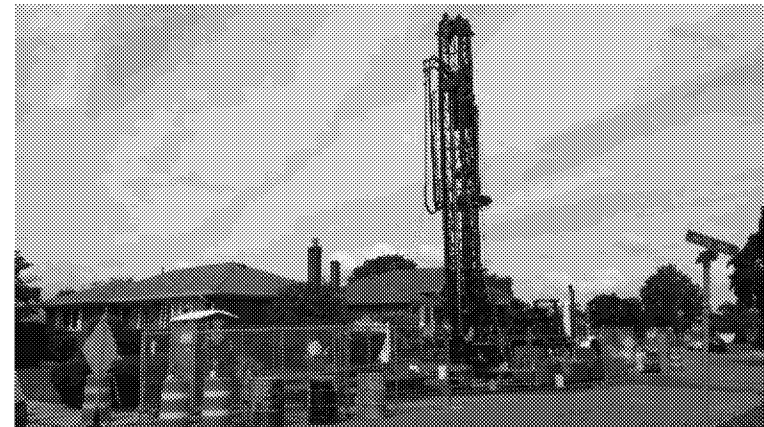
- **12-inch** diameter hole drilled into the ground;
- Final boring is **860 to 1,000** feet deep (extending to the Raritan Clay Layer);
- Drilling is stopped at selected depths and a device is lowered to sample the groundwater;
- **44 groundwater samples** are collected per boring and analyzed for Volatile Organic Compounds;
- **4 to 8 weeks** to complete a boring/well.

VPB AND WELL INSTALLATION PROCESS

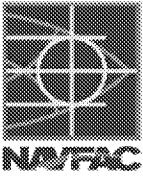


Process:

- Ideal map location selected by Navy and State;
- Location is then ground-proofed (visual check onsite) by the Navy;
- Drilling rig requires minimum of 100 feet with no overhead obstructions;
- Municipal properties preferred (drainage basins or township right of ways);
- Considerations to minimize inconvenience to residents nearby:
 - Health and Safety Concerns
 - Ingress and egress
 - Noise
- Advanced notification to nearest residence

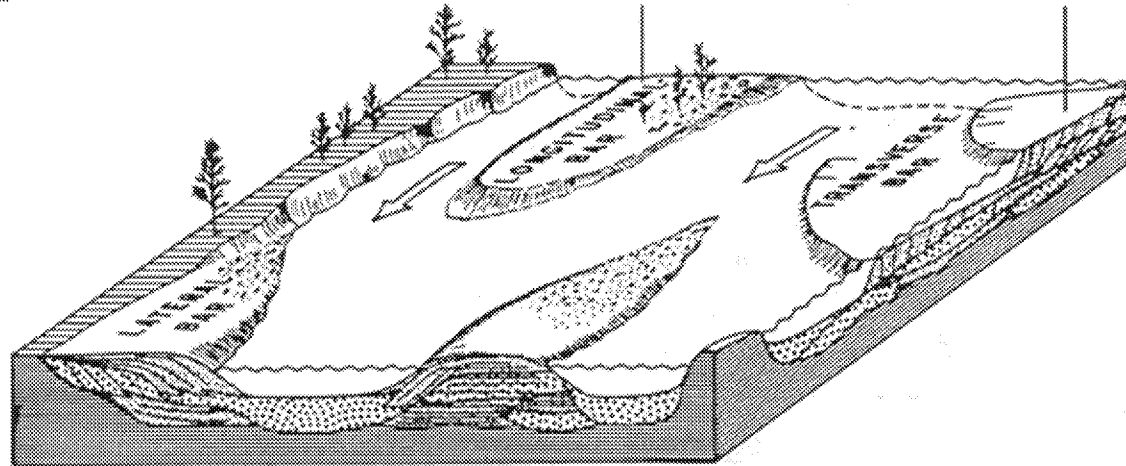


LOCAL GROUNDWATER GEOLOGY

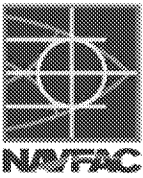


MAGOTHY AQUIFER

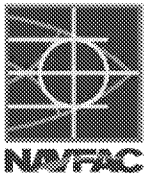
Interbedded clays, sands, and gravels



MODERN ANALOG – MACKENZIE RIVER DELTA



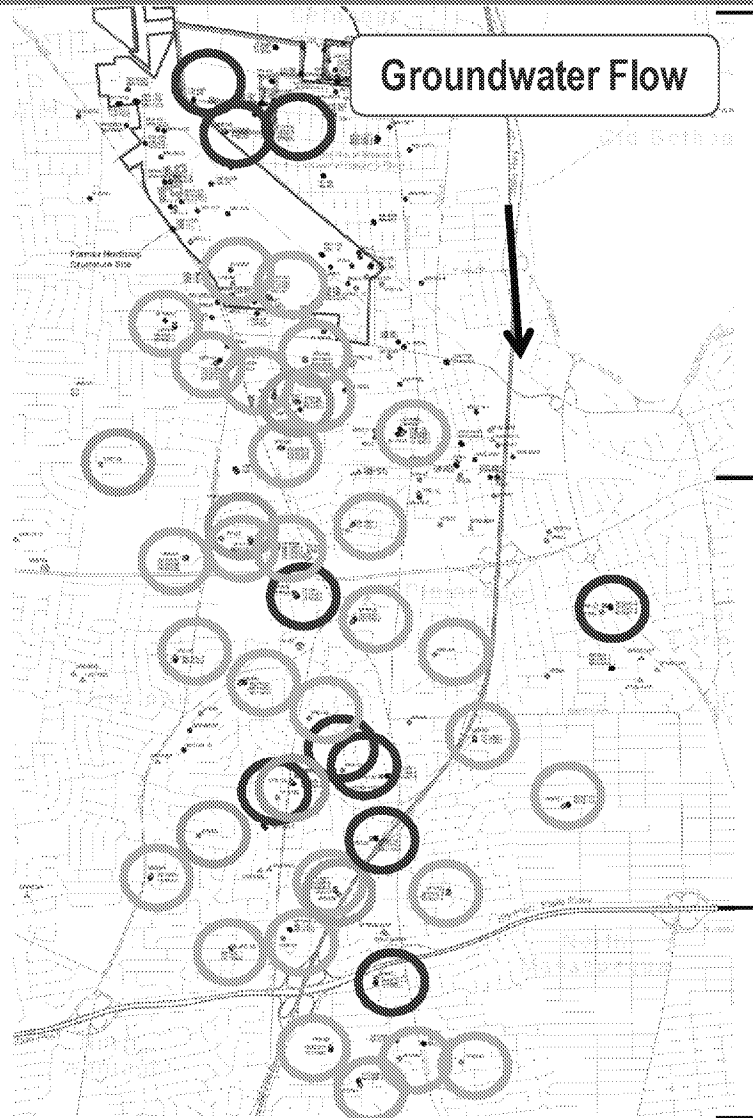
2009 – 2016 VERTICAL PROFILE BORINGS AND WELLS



2009
Completed
(green)

2010 to 2012
Completed
(blue)

2012 to 2016
Completed
(orange)



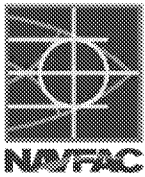
North of Hempstead
Turnpike Area

North of Southern State
Parkway Area

South of Southern State
Parkway Area

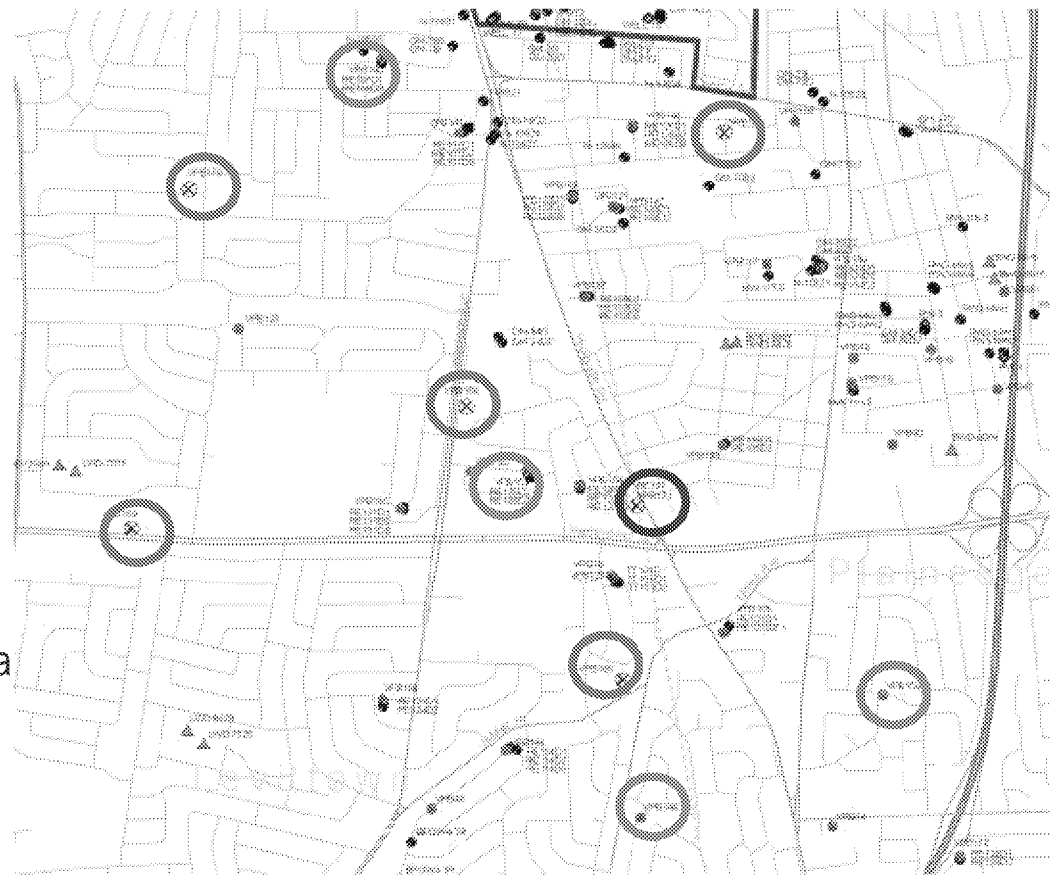
FUTURE WORK

VERTICAL PROFILE BORINGS AND MONITORING WELLS



Planned work through November 2017:

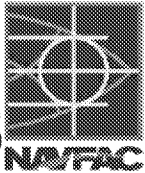
- Operation of 3 drilling rigs
- Installation of Vertical Profile Borings
 - 4 north of Hempstead Turnpike Area,
 - 1 north of Southern State Parkway Area
- Installation of Monitoring Wells
 - 14 north of Hempstead Turnpike Area
 - 7 north of Southern State Parkway Area
- Continue quarterly groundwater sampling
- Installation of VPB 171 and Test Recovery Well RE137 to address RE108 hotspot



Monitoring Wells to be installed
Monitoring Wells and VPB to be installed
Test Recovery Well and VPB to be installed

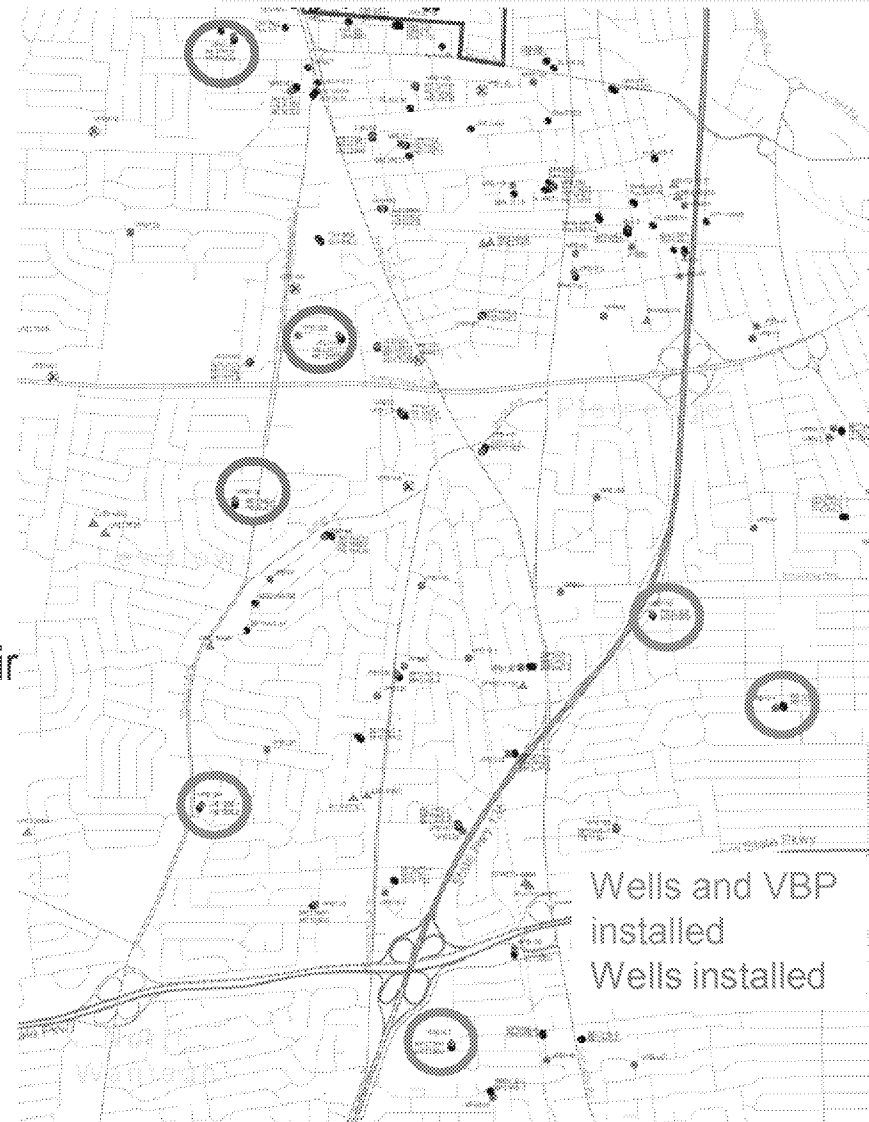
RECENT WORK

VERTICAL PROFILE BORINGS AND MONITORING WELLS

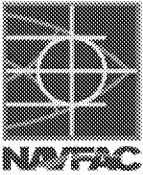


From April 2016 to present

- Operation of 3 drilling rigs
- North of Hempstead Turnpike
 - Installation of 4 monitoring wells associated with VPBs 140 and 159
- North of Southern State Parkway Area
 - Installation of 2 Monitoring wells associated with VPBs 158
 - Installation of 3 VPBs 161, 162 and 164 their 6 associated monitoring wells
- South of Southern State Parkway Area
 - Installation of VPB 167 and 2 associated monitoring wells
- Completion of 2 rounds of quarterly groundwater sampling



ASSESSING GROUNDWATER RESULTS



Laboratory analysis is performed for multiple volatile organic compounds.

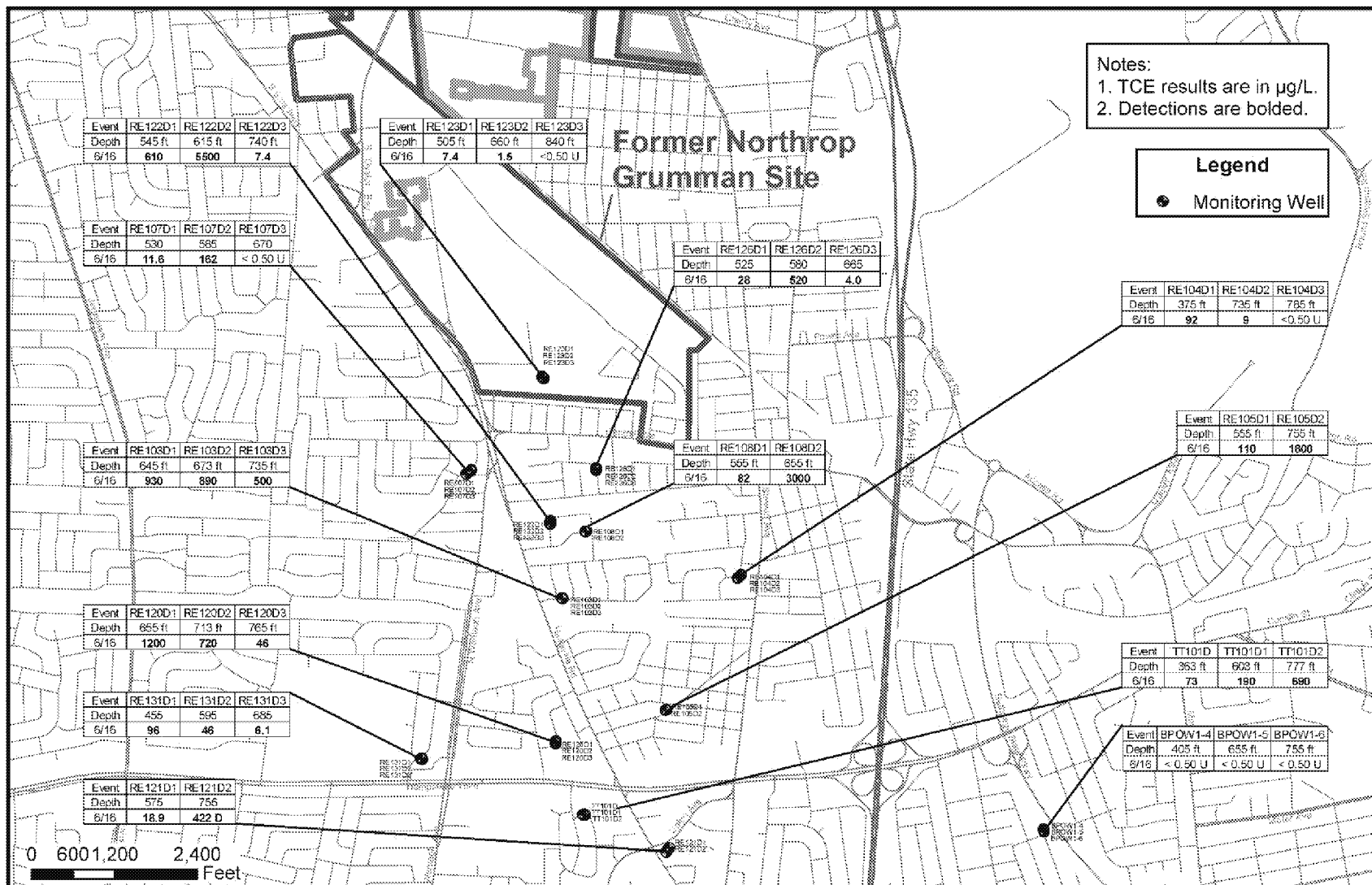
The primary contaminant being used to track the plume is trichloroethene (TCE) because it has the highest concentrations.

- Acceptable Maximum Contaminant Limit (MCL) is a limit established by Federal and State regulations
- The MCL for trichloroethene is 5 parts per billion

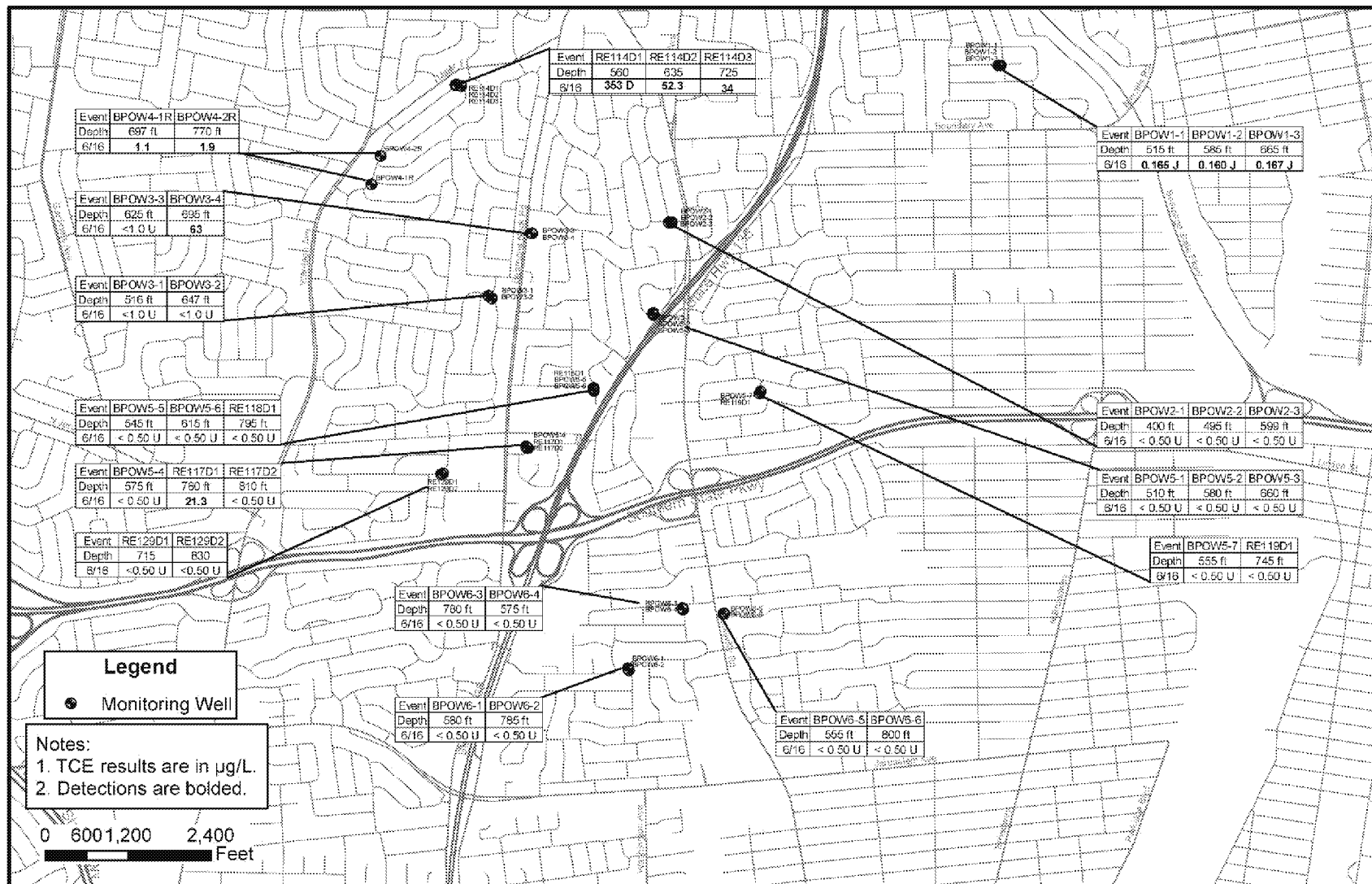
Hotspot Identification:

- Area with >1,000 parts per billion of total volatile organic compounds
- Defined in the Operable Unit 2 Offsite Groundwater 2003 Record of Decision

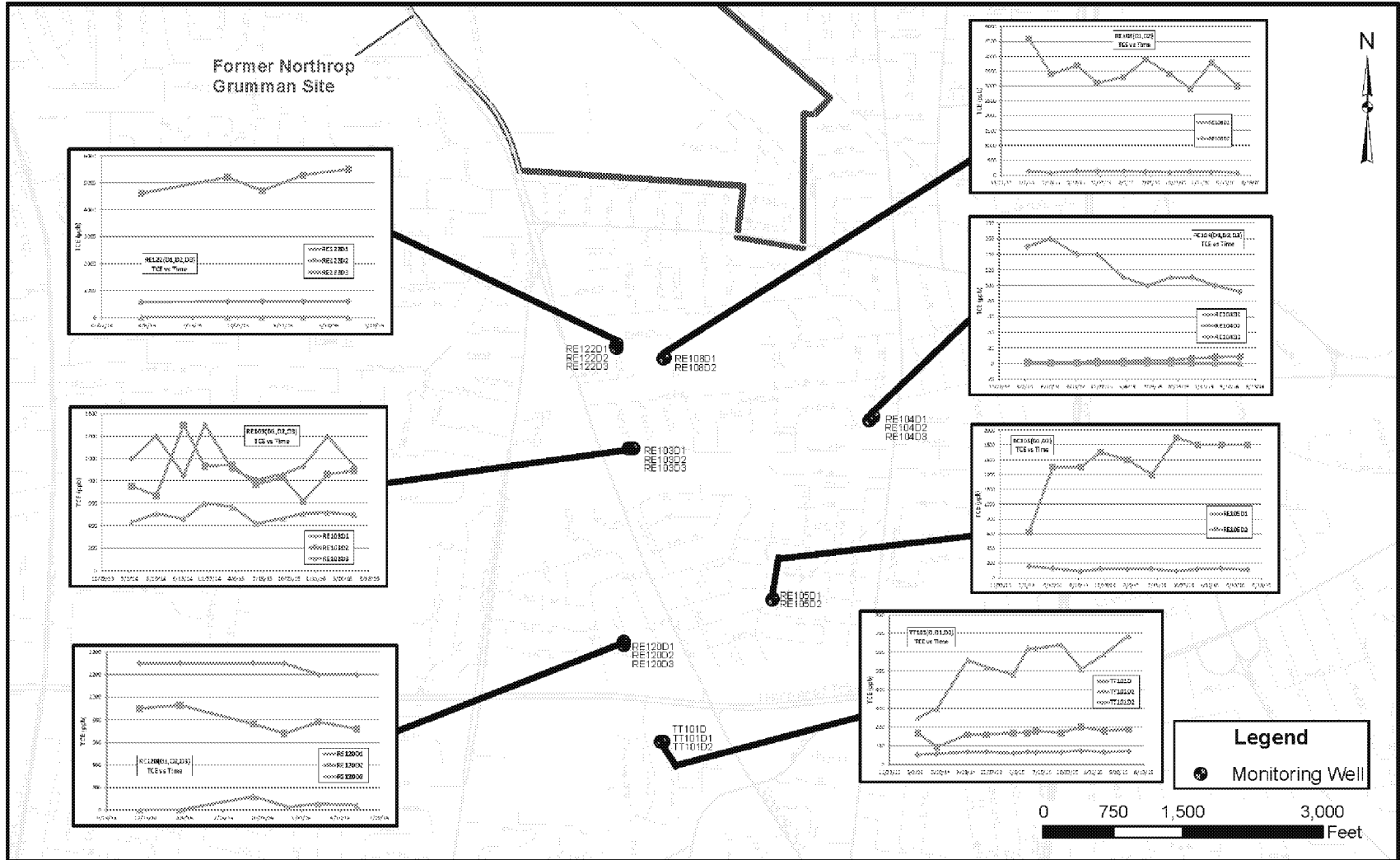
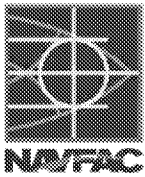
RECENT GROUNDWATER SAMPLING TRICHLOROETHENE RESULTS NORTHERN WELLS



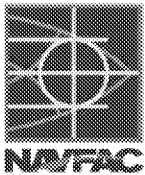
RECENT GROUNDWATER SAMPLING TRICHLOROETHENE RESULTS SOUTHERN WELLS



RECENT TRENDS IN RE108 HOTSPOT FROM QUARTERLY SAMPLING



GROUNDWATER SAMPLING RECENT RESULTS



• Conclusions:

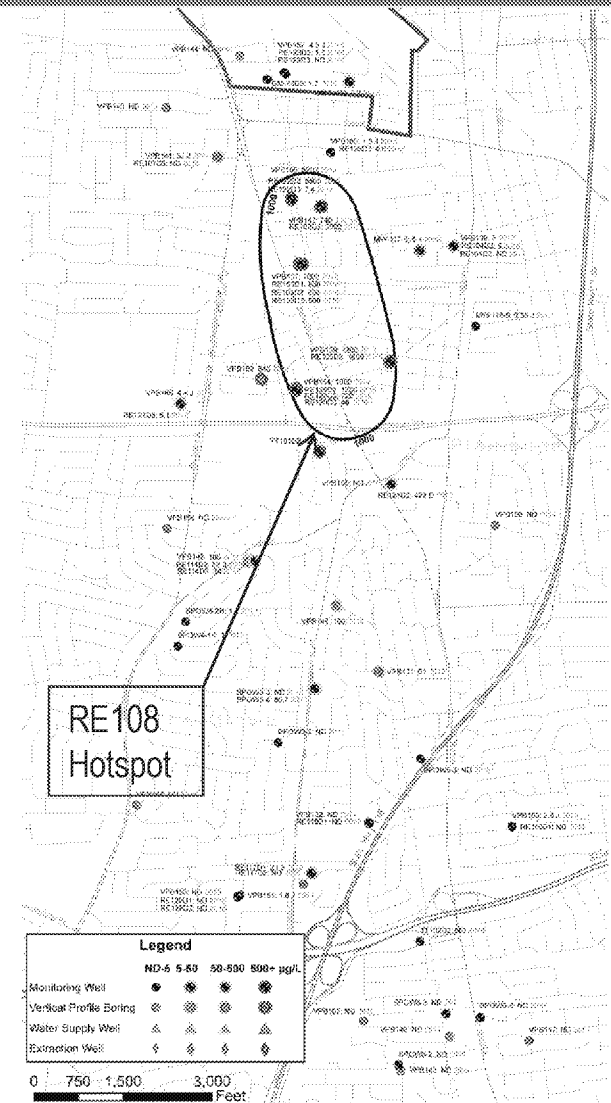
Objective 1 –Recently installed Outpost wells sampled quarterly

Objective 2 -Assessment of hotspots

- RE108 has been identified by latest phase of Navy drilling program;
- Trichloroethene found above 1,000 parts per billion in the North of Hempstead Turnpike Area at depths greater than 600 feet;
- Additional drilling is planned to the south and west;
- Installation of 1 test recovery well;

Objective 3 – Address Hotspot

- Treatment options are being evaluated to mitigate potential impacts to public water supply wells; Pilot study has been completed and a test recovery well is being installed;
- Groundwater monitoring will continue so concentration trends, if any, over time can be assessed.

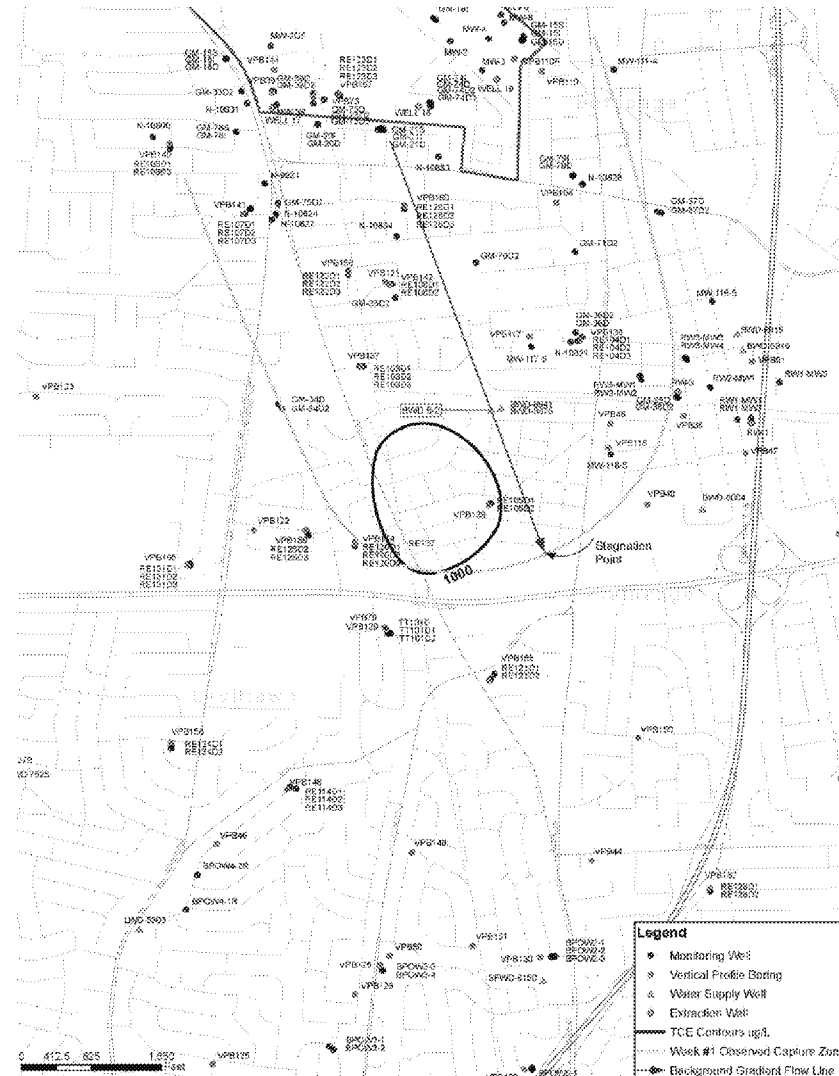
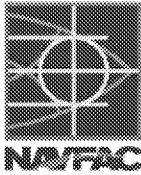


BWD WELL 6-2 CAPTURE ZONE ANALYSIS TEST

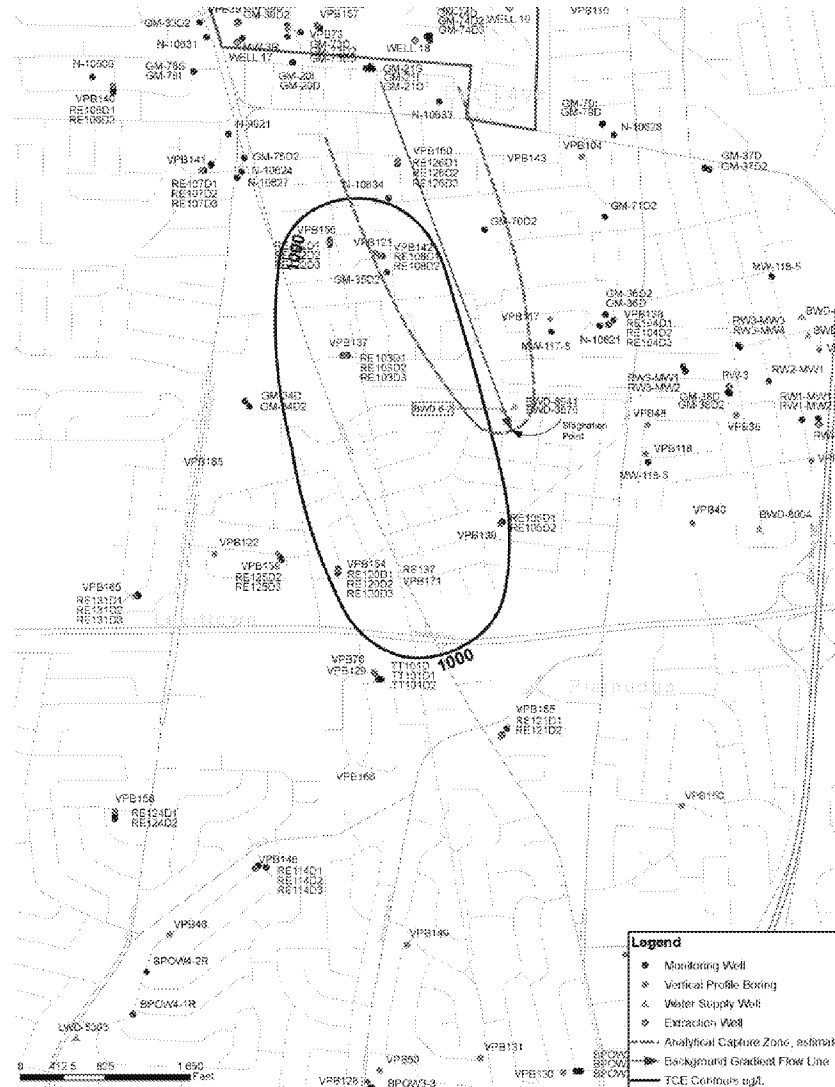
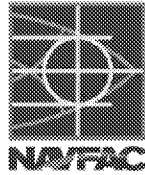


- Purpose of work is to identify capture zone of the BWD Plant 6 well in relation to the RE108 Hotspot;
- The test began March 21, 2016; and was completed on April 29, 2016;
- The depths used in the analysis to determine effects were Deep (greater than 700 feet bgs); Intermediate (600-700 feet bgs); and Shallow (500-600 feet bgs);
- Data analysis showed that at a rate of 1,153 gallons per minute the BWD Well 6-2 would capture a maximum of 100% of the deep RE108 Hotspot;
- BWD Well 6-2 would capture 14% of the intermediate and shallow RE108 Hotspot;
- The capture zone size varies depending on the pumping of existing remediation and water supply wells.

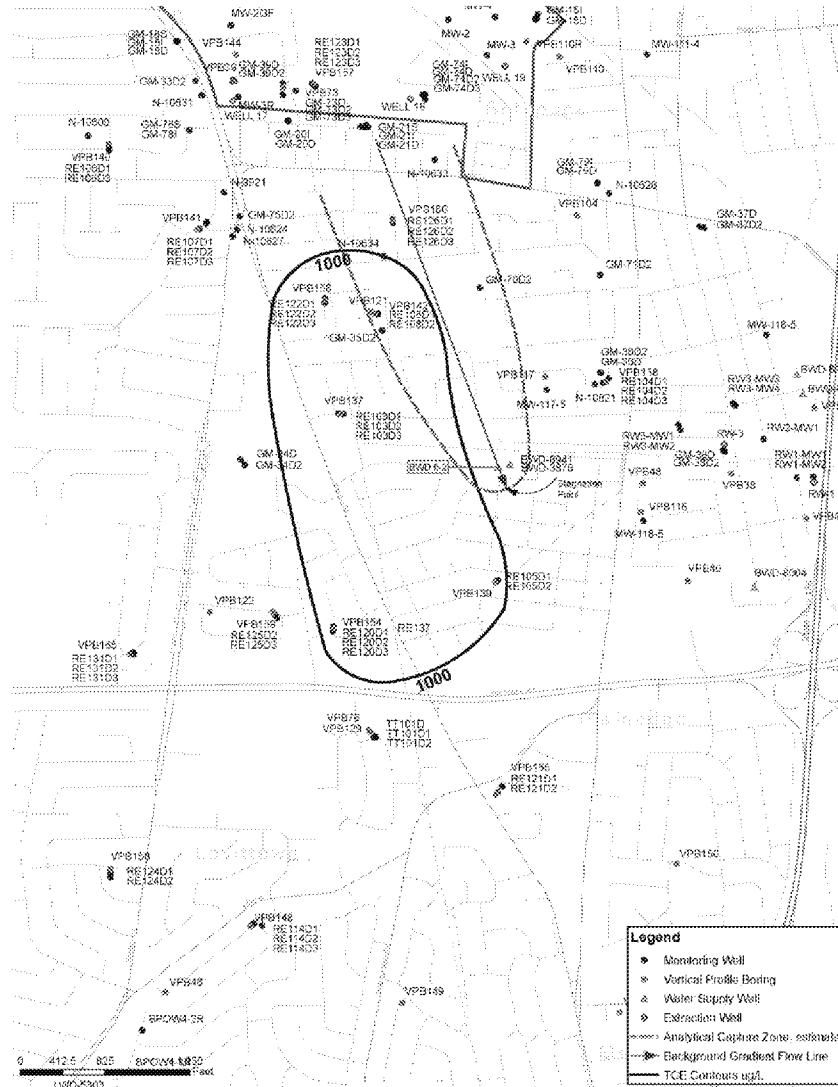
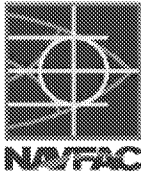
BWD WELL 6-2: TRICHLOROETHENE PLUME AND DEEP CAPTURE ZONE



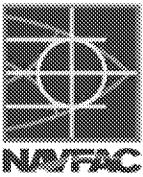
BWD WELL 6-2: TRICHLOROETHENE PLUME AND INTERMEDIATE CAPTURE ZONE



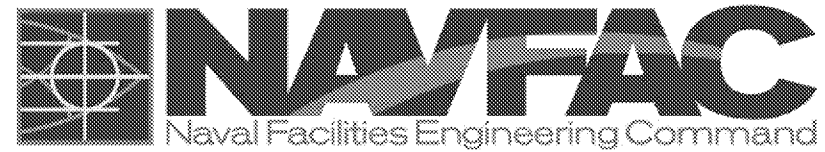
BWD WELL 6-2: TRICHLOROETHENE PLUME AND SHALLOW CAPTURE ZONE



VPB AND TEST RECOVERY WELL INSTALLATION IN RE108 HOTSPOT



- VPB (VPB 171) and a test recovery (RE137) well are being drilled in Nassau County recharge basin #305, near intersection of Hicksville Road and Hempstead Turnpike;
- Drilling is expected to be completed by January 2017;
- Aquifer testing to evaluate the capture zone of the test recovery well is expected to take 5 days;
- Data analysis is expected to be completed by July 2017.



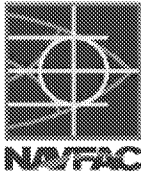
RE108 HOTSPOT UPDATE

NOVEMBER 2016 RESTORATION ADVISORY BOARD

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE
LONG ISLAND, NEW YORK

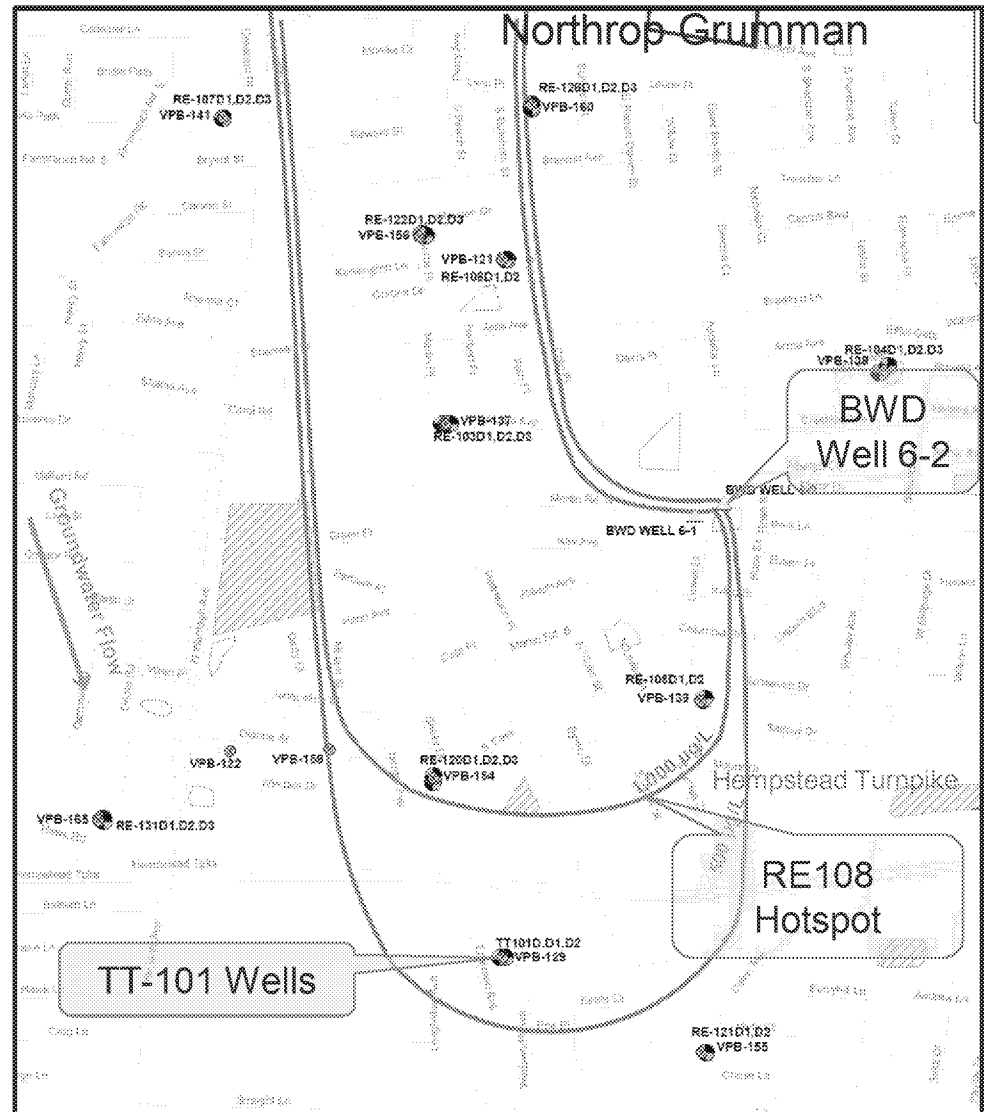
11/16/2016

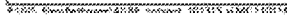
RE108 Hotspot Area Investigation



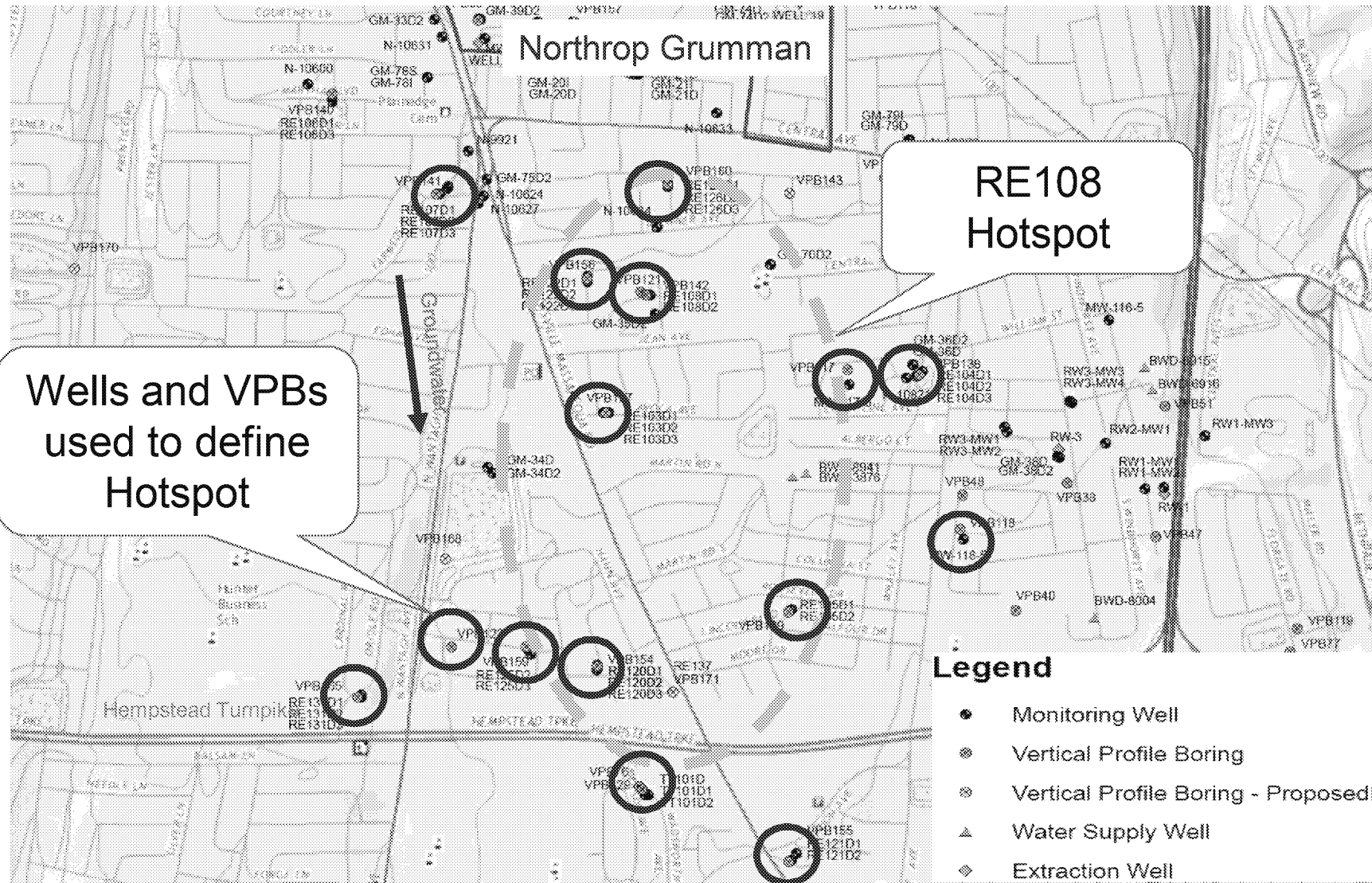
- RE108 Hotspot Area

–Vertical profile boring and monitoring well investigations are ongoing, but is sufficient to proceed with preliminary design activities

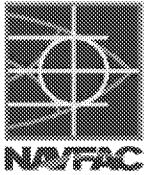




RE108 Hotspot Area – Plume Delineation Using Vertical Profile Borings

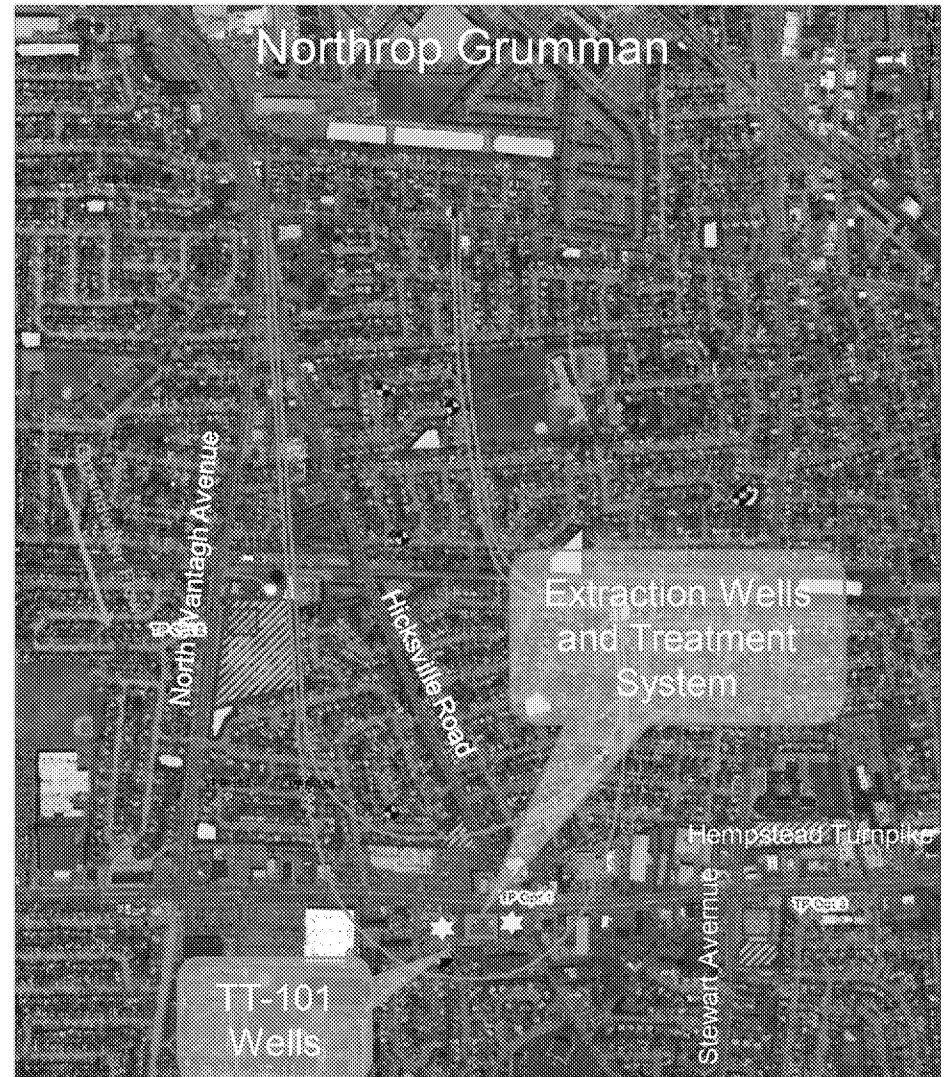


RE108 Hotspot Area

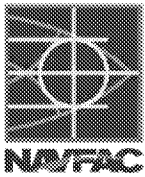


Design

- Pumping rate of 900 to 1,200 gallons per minute
- Treatment Process: Air Stripping and Granular Activated Carbon
- Treatment Goal: Drinking Water Standards
- Treatment Plant Dimensions: 80 feet by 100 feet by 25 feet high
- Treatment Plant property buffer, minimum of 100 feet to occupied structures – 2 acres

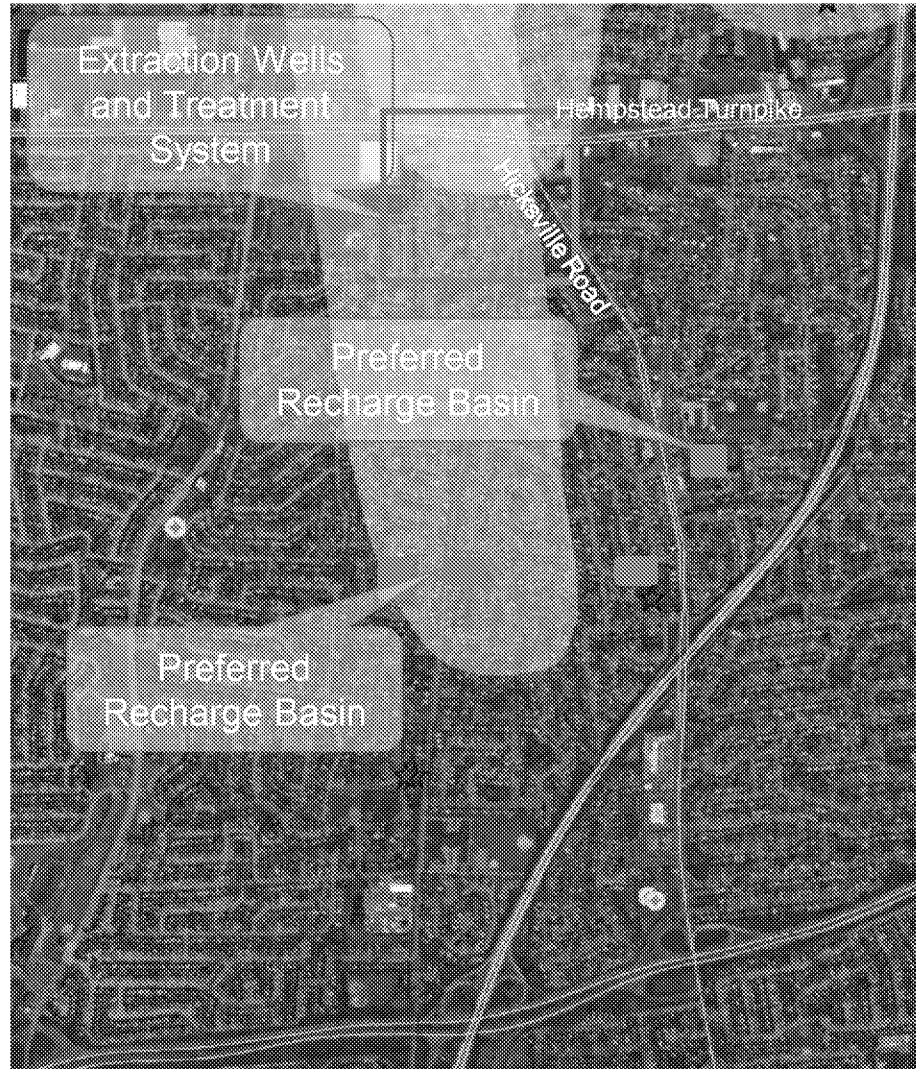


RE108 Hotspot Area

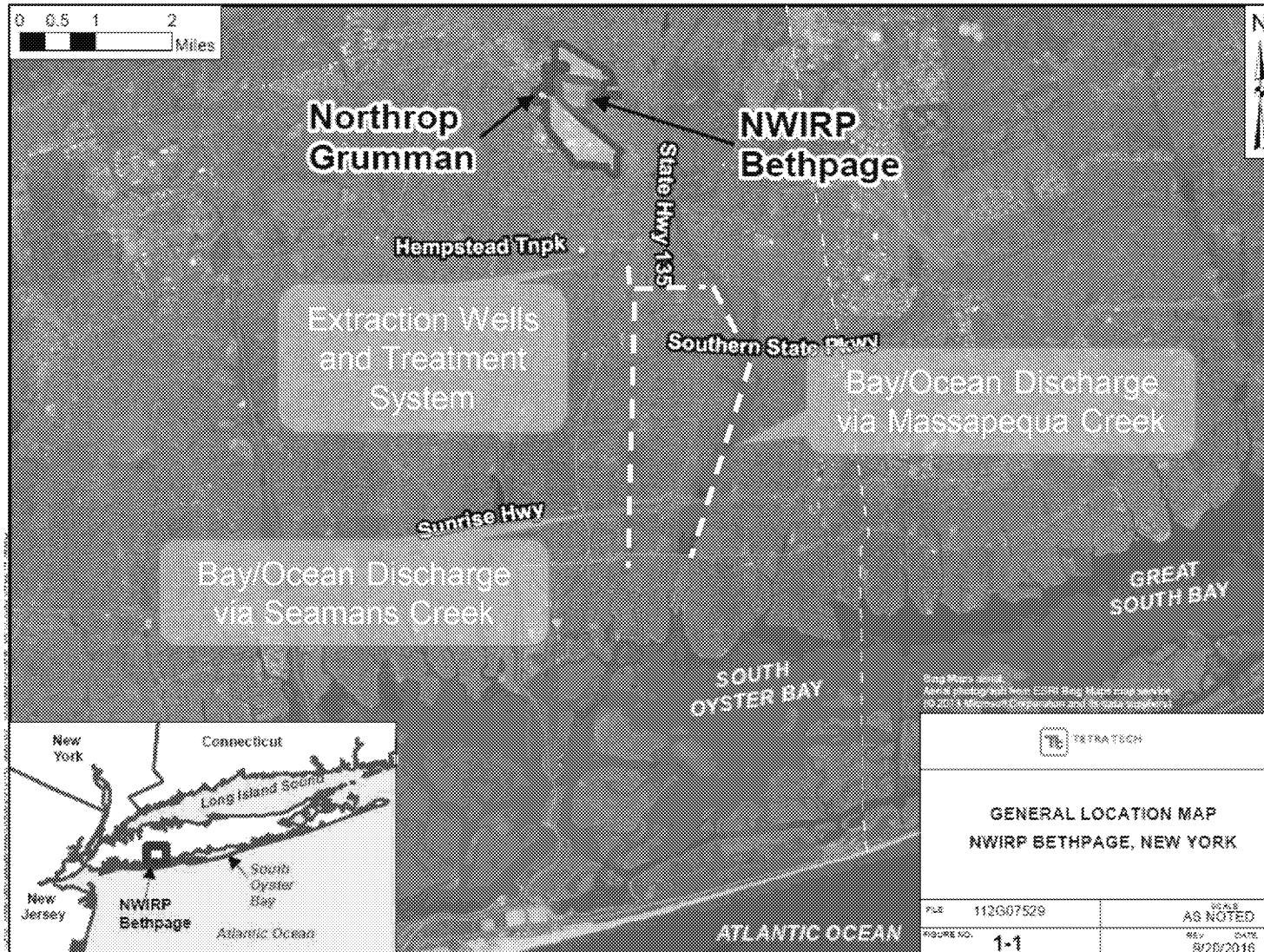
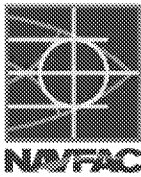


Design (Continued)

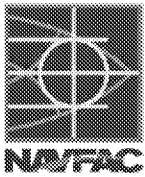
- Discharge to Recharge Basin, Hicksville Road – 3,500 feet southeast
- Other potential discharge options for treated water include:
 - Injection Wells various locations
 - Creeks/South Oyster Bay



RE108 Hotspot Area, Other Potential Discharge Options



RE108 Hotspot Area Path Forward



Path Forward

- Preliminary design activities underway, including pumping and basin recharge testing planned for 2017
- Basis of Design Report – 2017
- Property Access Underway – 2016 to 2019
- Detailed Design Activities – 2019 and 2020
- Construction/Startup – 2021 and 2022



FEASIBILITY STUDY ADDENDUM
SITE 1 – FORMER DRUM MARSHALLING AREA

NOVEMBER 2016 RESTORATION ADVISORY BOARD

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE
LONG ISLAND, NEW YORK

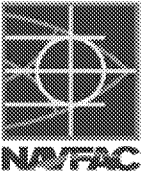
11/16/2016

Site 1 History

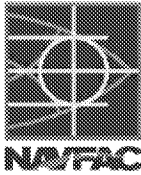
- Two former drum marshalling pads
- 120 abandoned cesspools for sanitary waters from Plant 3
- Drywells – Area of Concern (AOC) 34-07 and AOC 20-08 for storm water
- AOC 23-Former Aboveground Storage Tanks (ASTs),
- AOC 35-Former Sludge Drying Beds, and
- AOC 30-Storage Sheds



Site 1 - 2016 Photographs



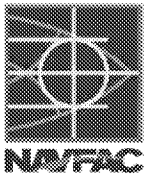
Site 1 History



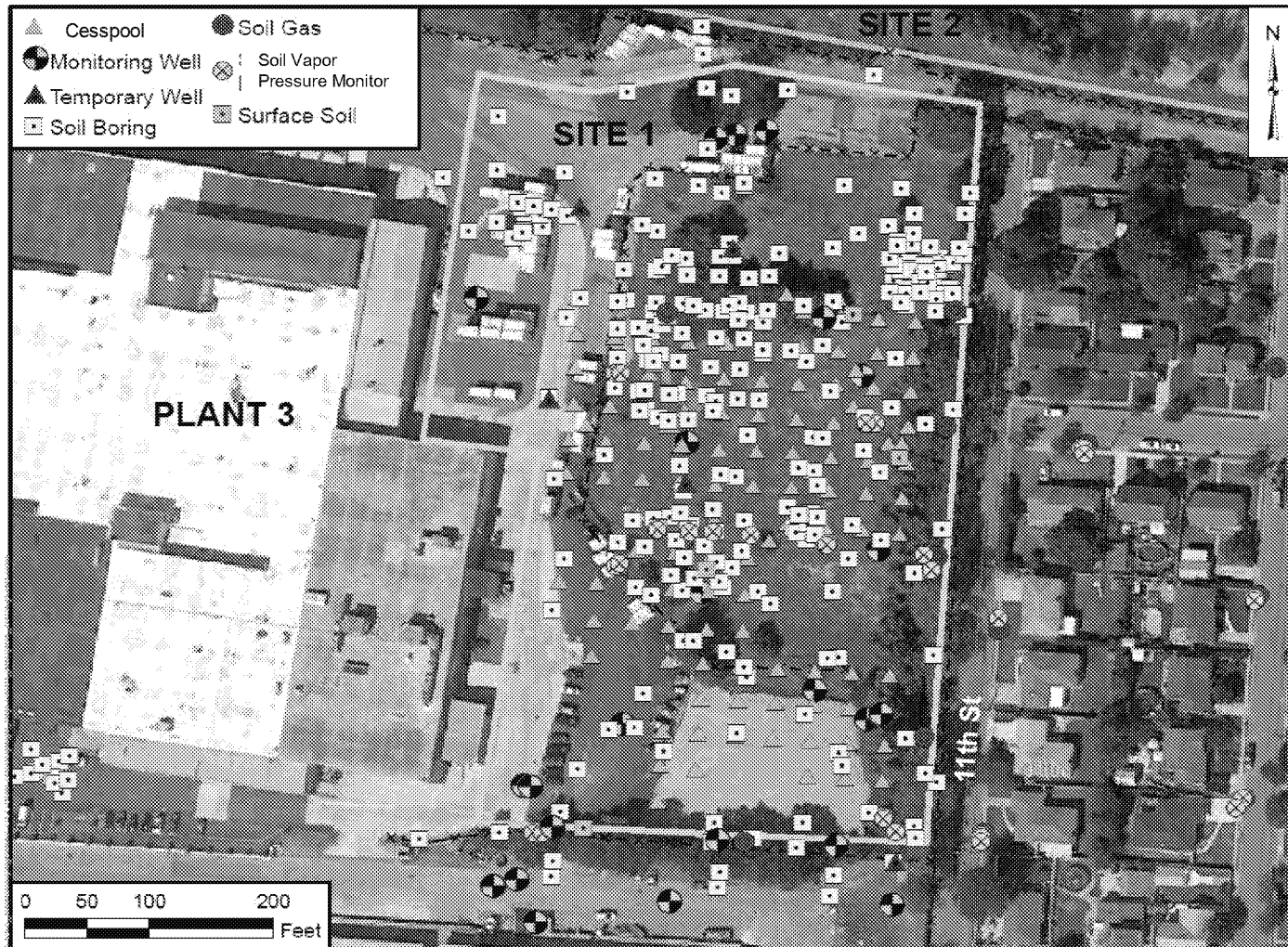
Remedial Site Activities

- 1992 to 1995- Initial investigations through Remedial Decision, chemical of concern:
 - Polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), and metals
- 1995 to 2008- Additional investigations conducted, volume of PCB-impacted soil increased from 1,400 cubic yards to over 38,000 cubic yards
- 1997 to 2002- Source area cleanup of volatile organic compound (VOC)-impacted soil and shallow groundwater
 - Air Sparging/Soil Vapor Extraction (SVE) Remediation System
 - 4,520 pounds of VOCs had been extracted and treated
 - Achieved greater than 95% reduction of VOCs in groundwater
- 2009 to 2013- Supplemental soil and groundwater investigations
- 2010 to 2016- SVE Containment System operates to address vapor intrusion
- 2015 Remedial Investigation Addendum completed

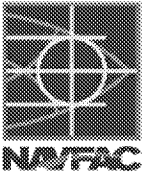
Site 1 Remedial Investigation Addendum



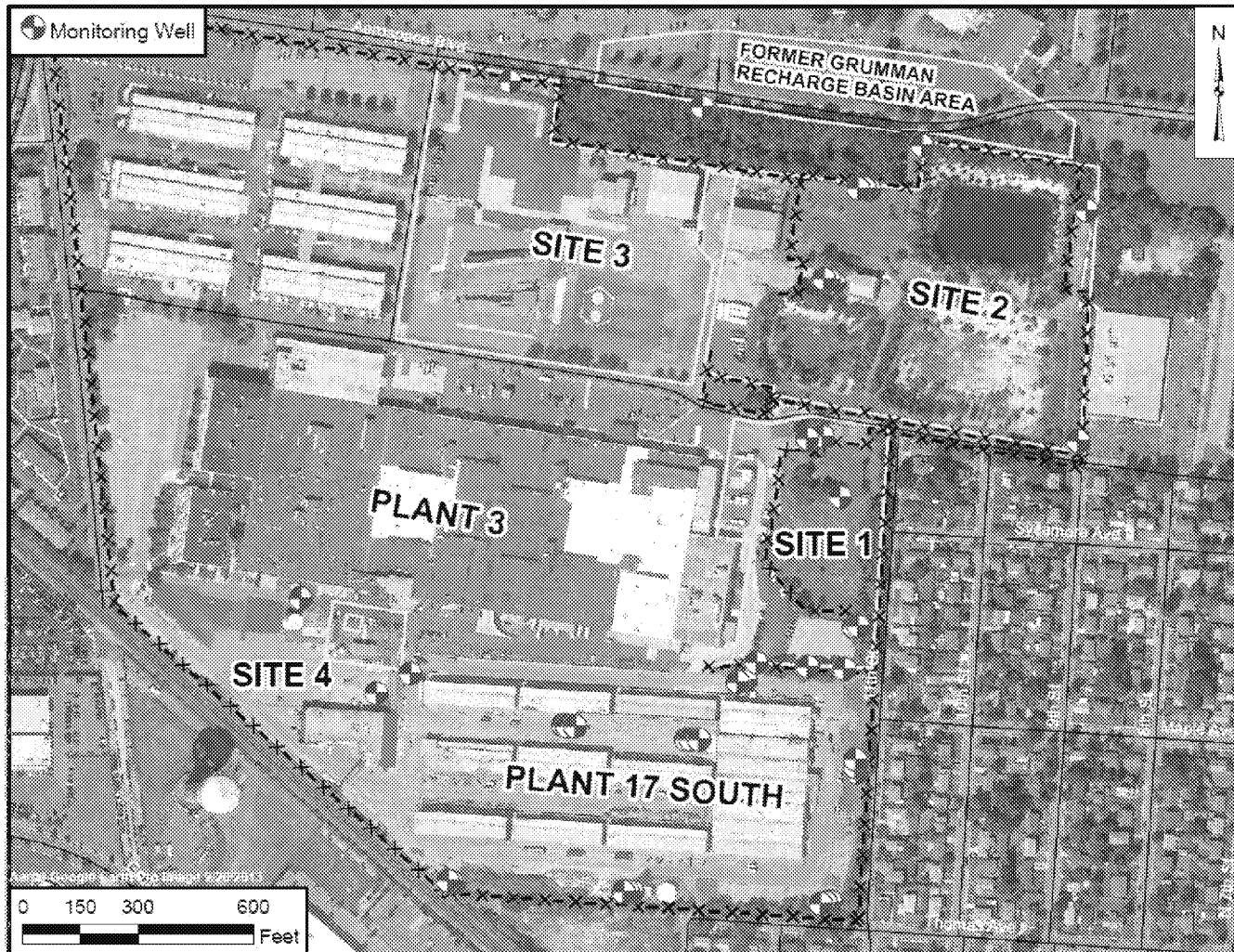
Field Activities (1991 to present)



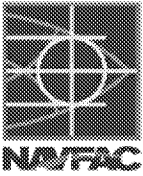
Site 1 Remedial Investigation Addendum



Groundwater Field Activities (2009 to 2013)

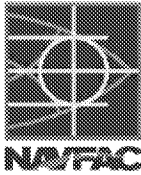


Site 1 Remedial Investigation Addendum

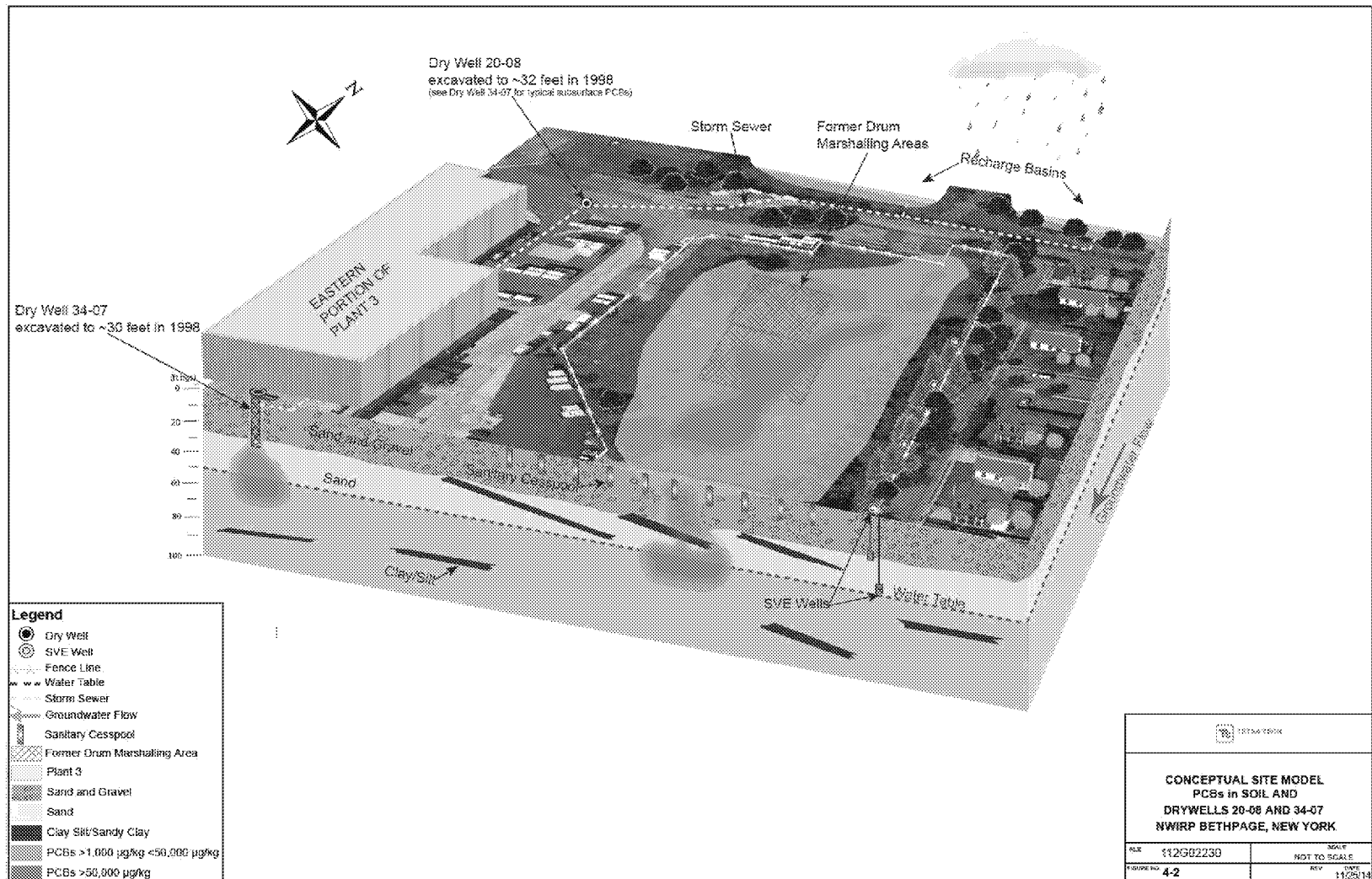


- Media and chemicals to be addressed:
 - Soil: Polychlorinated biphenyls (PCBs), chlordane, polynuclear aromatic hydrocarbons, metals
 - Groundwater: PCBs, arsenic, and hexavalent chromium
 - Soil Vapor (Vapor Intrusion): Tetrachloroethene and trichloroethene

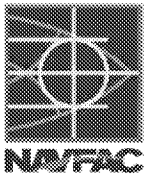
Site 1 Remedial Investigation Addendum



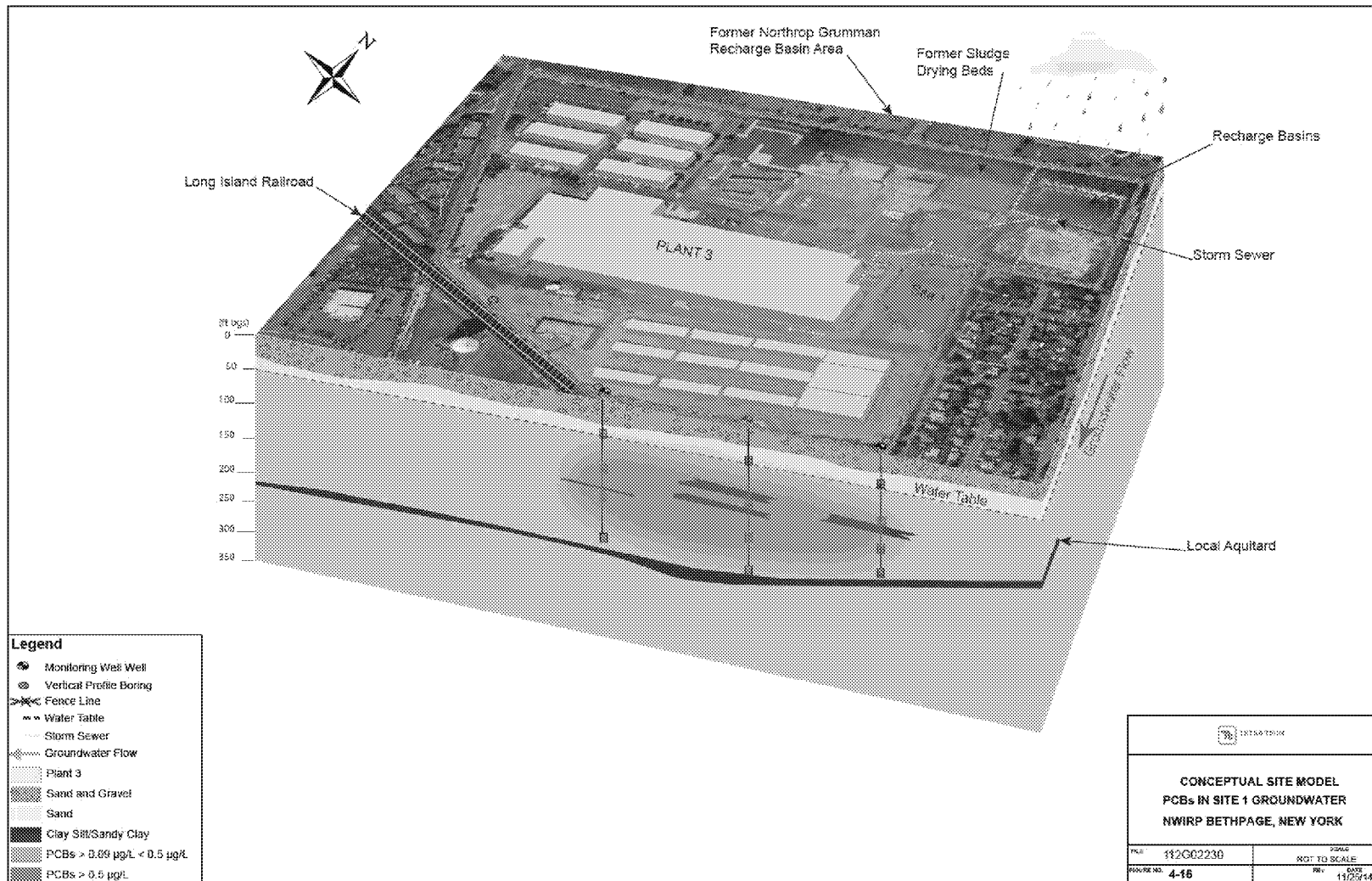
Results - PCBs in Soil



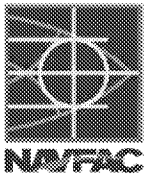
Site 1 Remedial Investigation Addendum



Results – PCBs in Groundwater

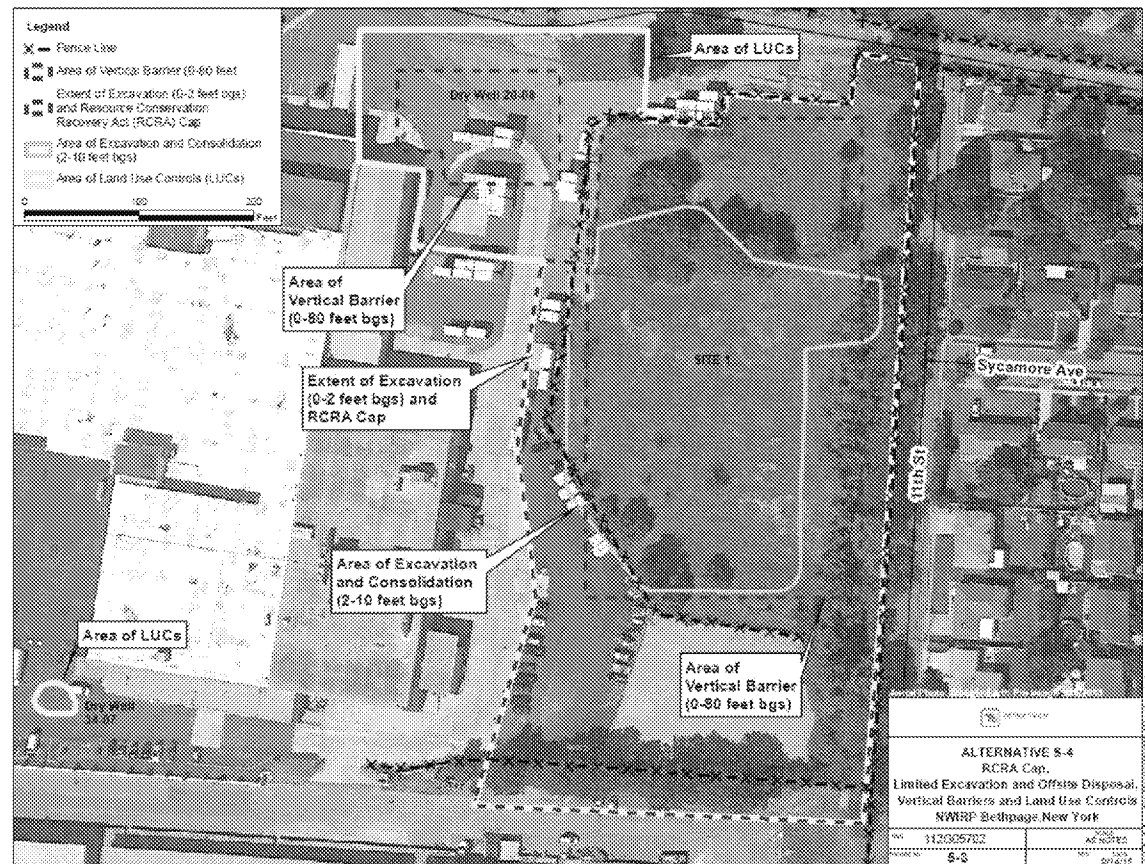


Site 1 Feasibility Study Addendum



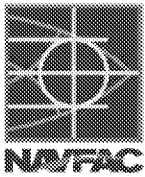
Soil Alternatives

- S-1: No Action
- S-2: Permeable Cover, Limited Excavation and Offsite Disposal of PCB-Contaminated Soil (Greater than 10 mg/kg), and Land Use Controls
- S-3: RCRA Cap, Limited Excavation and Offsite Disposal of PCB-Contaminated Soil (Greater than 25 mg/kg), and Land Use Controls
- S-4: RCRA Cap, Limited Excavation and Offsite Disposal of PCB-Contaminated Soil (Greater than 25 mg/kg), Vertical Barrier, and Land Use Controls



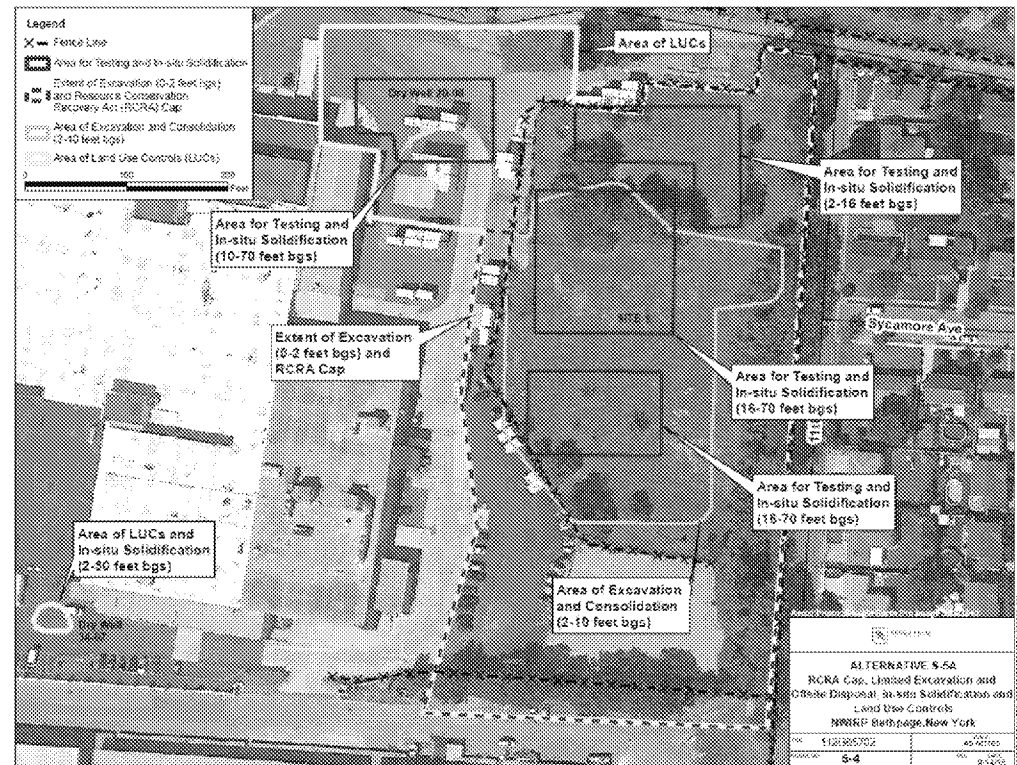
RCRA – Resource Conservation and Recovery Act
mg/kg – milligram per kilogram

Site 1 Feasibility Study Addendum

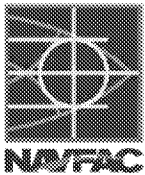


Soil Alternatives

- S-5A: RCRA Cap, Limited Excavation and Offsite Disposal of PCB-Contaminated Soil (Greater than 25 mg/kg), In-situ Solidification of PCB-Contaminated Soil (Greater than 50 mg/kg), and Land Use Controls
- S-5B: RCRA Cap, Limited Excavation and Offsite Disposal of PCB-Contaminated Soil (Greater than 25 mg/kg), Vertical Barrier, In-situ Solvent Extraction of PCB-Contaminated Soil (Greater than 50 mg/kg), and Land Use Controls
- S-6: Excavation and Offsite Disposal of PCB-Contaminated Soil (Greater than a Depth-Dependent 10 mg/kg or 50 mg/kg), Soil Cover, and Land Use Controls
- S-7: Excavation and Offsite Disposal of PCB-Contaminated Soil (Greater than 1 mg/kg)

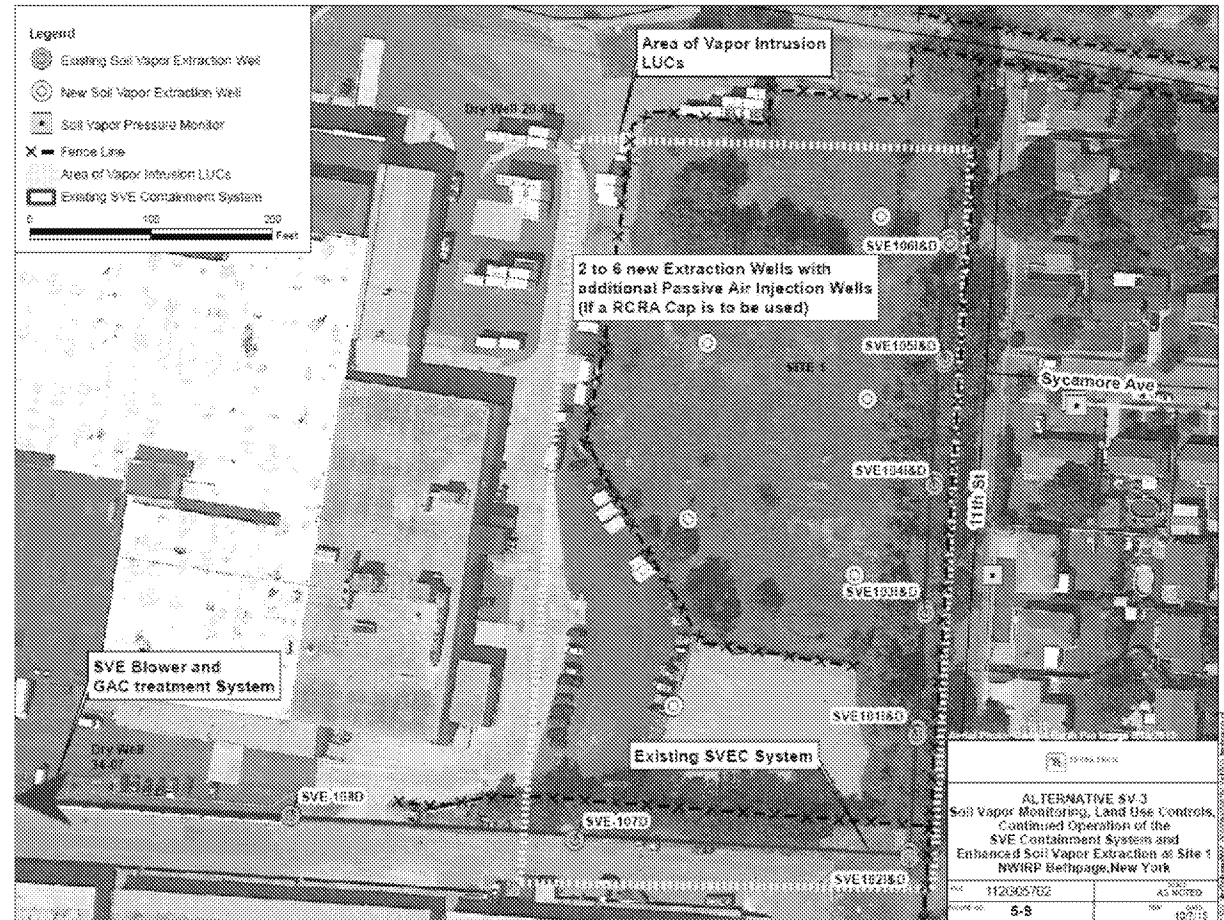


Site 1 Feasibility Study Addendum

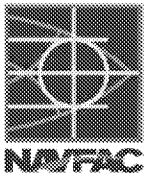


Soil Vapor Alternatives

- SV-1: No Action
- SV-2: Soil Vapor Monitoring, Land Use Controls, and Continued Operation of the SVE Containment System
- SV-3: Soil Vapor Monitoring, Land Use Controls, Continued Operation of the SVE Containment System, and Enhanced Soil Vapor Extraction at Site 1



Site 1 Feasibility Study Addendum

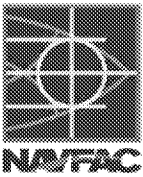


Groundwater Alternatives

- G-1: No Action
- G-2: Monitoring and Land Use Controls
- G-3A: Monitoring, Land Use Controls, and Upgrade of the ONCT System with GAC Treatment
- G-3B: Monitoring, Land Use Controls, and Upgrade of the ONCT System with Ion Exchange Treatment



Path Forward



- 2017 Proposed Plan (45-day public comment period)
- Public Meeting in Jan/Feb 2017 (to be announced)
- 2017 Record of Decision
- 2017 Design
- 2018 Start Cleanup